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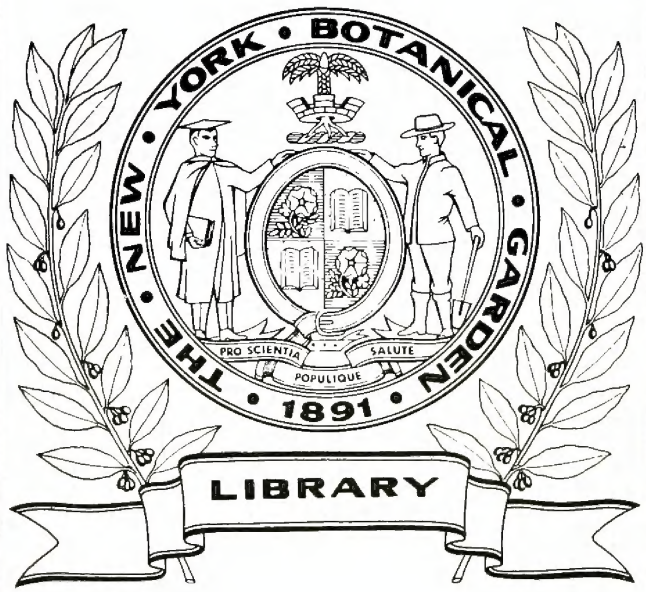

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OF

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

VOLUME X

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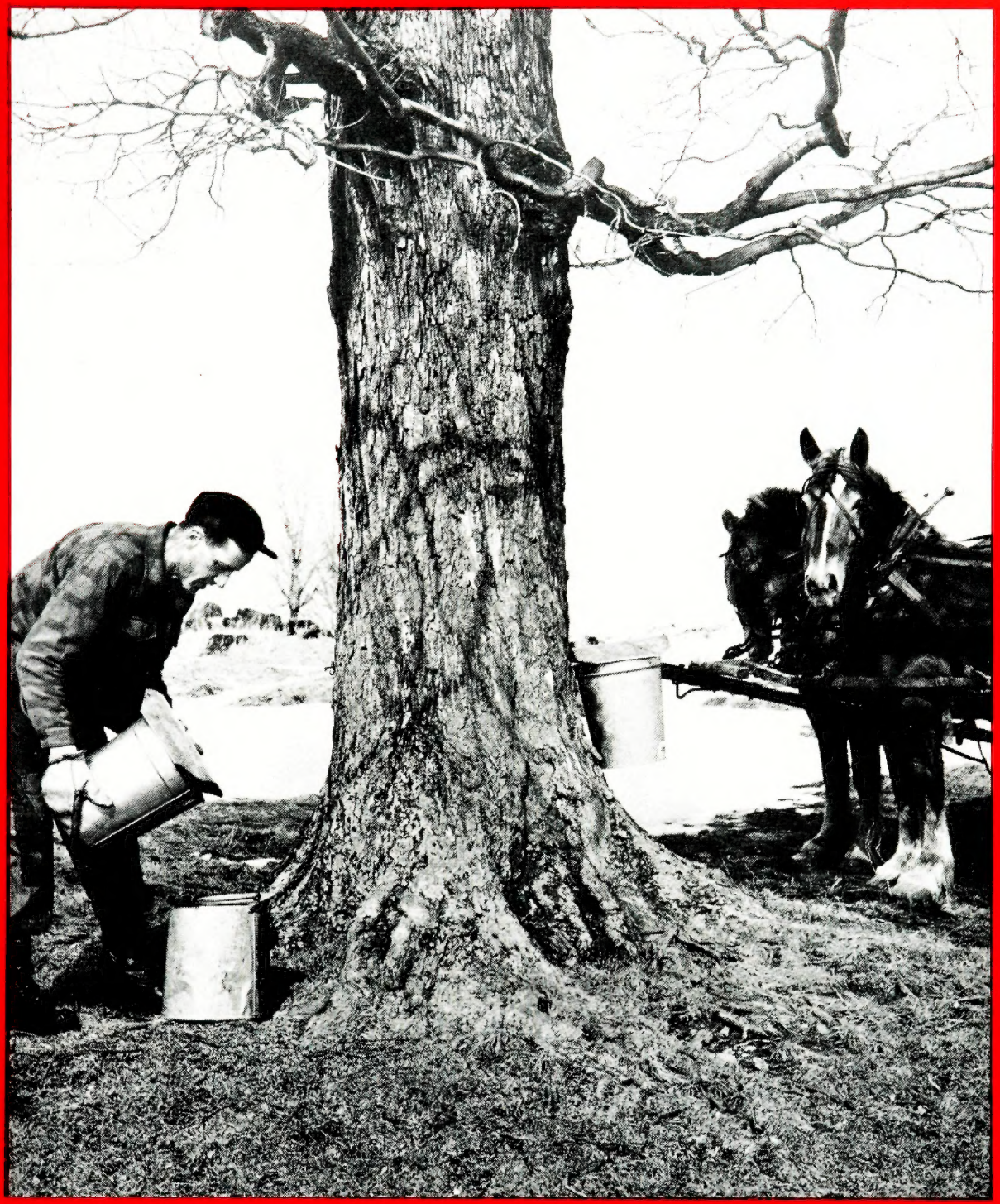

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 1 January - February, 1960

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DOROTHY EBEL HANSELL
Editor

CALENDAR

Downtown Lecture Series 1960, sponsored by the Volunteer Associates of The New York Botanical Garden: January 7, Dr. William C. Steere—"The Geographical Distribution of Plants, Why They Grow Where They Do"; January 14, Dr. George L. Slate — "Garden Lilies"; January 21, A. Hyatt Mayor—"Renaissance and Baroque Gardens"; and January 28, Dr. Harold Gray—"Gardening Under Glass," in the auditorium of the French Institute Building, 22 East 60th Street, New York, N. Y.

January 12-15, 1960. Seventh Annual Flower Show Symposium, Grace Rainey Rogers Auditorium, Metropolitan Museum of Art, New York, N. Y. On the second day, Louis P. Politi will conduct a horticultural workshop on "Chrysanthemums" and E. J. Alexander one on "Cacti and Succulents." Sponsored by The Federated Garden Clubs of New York State, Inc.

January 15-March 15, 1960. Exhibit "Ecology of the Redwoods" at The New York Botanical Garden, staged on behalf of the Garden by the Conservation, the Horticultural, the National Parks, and the Redwood Grove Committees of the Garden Club of America.

January 16, 1960, 12:30 p.m. Gloxinia Society meeting at The New York Botanical Garden.

January 19, 1960. New York State Arborists' visit to The New York Botanical Garden.

February 6, 1960, 3:30 p.m. Dr. William C. Steere, Director of The New York Botanical Garden, will give an illustrated talk on "Ecology of the Redwoods" as the Free Saturday Afternoon Program in the Lecture Hall of the Museum and Administration Building, in connection with the Garden Club of America's exhibit on "Ecology of the Redwoods."

February 17, 1960, 8:15 p.m. Members' Evening of The New York Botanical Garden at the New York Genealogical and Biographical Society, 122 East 58th Street, New York, N. Y. Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research of The New York Botanical Garden, will present his superb colored film, "Lost Worlds of Venezuela," with running commentary.

March 4-12, 1960. National Capital Flower and Garden Show, The Armory, Washington, D.C.

March 5-12, 1960. International Flower Show, The Coliseum, New York, N. Y.

March 7-12, 1960. Spring Flower Show, Commercial Museum, Philadelphia, Pa.

March 13-20, 1960. New England Spring Flower Show, Boston, Mass.

April 8, 1960, 2 p.m. Easter Show in the Conservatory opens to members of The New York Botanical Garden.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, Mrs. Donald B. Straus for the selection of the front cover illustration; p. 4—courtesy Mrs. Roy Arthur Hunt; p. 6—courtesy The Gloxinias, published by the American Gloxinia Society; pp. 8, 9, J. J. Wurdack; pp. 10, 12, 13, E. N. Mitchell; p. 10, upper, Herman F. Becker, lower, N. Y. Times; pp. 15, 16, H. Teuscher — courtesy American Orchid Society Bulletin; pp. 19, 20, 21, 22, Serating—courtesy Sterling Forest Gardens; pp. 23, 24, Jake Gerling; p. 25, upper, E. N. Mitchell; p. 25, lower, pp. 26, 27, 28, P. P. Pirone; p. 33, two upper, E. N. Mitchell; pp. 3, 4, Charles C. Clare, Jr.

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Some French Plant Breeders and Their Work in Horticulture

By **André de Vilmorin**

This is based on the talk given by M. de Vilmorin, Vice-President of the Horticultural Society of France, at the Fourteenth Annual American Horticultural Congress, Rochester, New York, October 1959.

IF ONE LOOKS BACK to what is known of horticulture in the past four centuries, one discovers that very often the taste for gardens has nothing to do with the taste for plants. I wager that King Louis XIV could not tell the difference between a pansy and a viola, but he was extremely proud, and rightly, of the garden Le Nôtre made for him at Versailles. This is not only true for Le Nôtre but for the other great geniuses of French landscape architecture: Laborde, François Joseph Belanger, Charles Rivière Dufresny and so on. When one walks in these strikingly beautiful gardens at Versailles, at Vaux, at Chantilly, at St. Cloud or at Méréville one cannot but admire the perfection of design and harmony that is created between the palaces and the gardens surrounding them. The whole would make a perfect frame for flowers; but only a few flowers were used, and they were rather ordinary ones. The love for plants was not born yet, that is to say, a plant did not exist for itself as an individual having its own personality.

Most of us derive great pleasure at seeing a rare or even an unusual plant, and a real collector does not look long at a common plant even if it is beautiful. But in France in those days of the seventeenth and eighteenth centuries trees and shrubs and flowers were used only for their shapes or their colors without concern for their identity. The passion that some Dutch collectors of the seventeenth century had for rare varieties of tulips was not understood by Frenchmen; they found it even laughable. The fashion was rather to decorate gardens and parks with accessories such as grottoes, waterfalls, statues and temples. The only plant collections of which we have records are those of boxwoods or yews in topiary forms—some like musical instruments, some like birds or animals—in gardens at Saint-Ouen, near Paris, that belonged to a priest who was ridiculed for them. If I speak of those times when collectors were unknown in France, it is because I believe that after a period of one hundred and fifty years during which gardeners became plant specialists, we are now reaching the times when few of the real plant specialists will remain and general gardens will become more and more popular.

We must go back to the beginning of the nineteenth century to find a really well-known collection of plants. I refer to the collection of roses brought from all over the world to the garden of La Malmaison for the Empress Josephine, the first wife of Napoleon. But why did this change occur? Because of the new plants that were brought to the country by ship from China, from America, and from the Cape of Good Hope.

André Michaux was one of the first to collect plants in Persia and in America —he even had a nursery near New York City to ship them to France. Michaux died in his round-the-world trip that he undertook to collect more plants. In the last twenty-five years of the eighteenth century, missionaries and travelers were bringing unknown species from everywhere, and these were multiplied and distributed mainly by Jacques Martin Cels and by my ancestor, Philippe Victoire de Vilmorin, and his son, Philippe André. It may appear lacking in modesty to speak about my own family, but we have been scientists, horticulturists, and collectors for seven generations . . . we have been connected in one way or another with plants for the last two centuries. That explains how my great-grandfather was so friendly with Father David, the first one responsible for the horticultural revolution that happened in France one hundred years ago.

From China, Father David brought back new plants by the thousands. He made three trips to different parts of that country. The first one took him to Pekin, then northern Mongolia, especially Ourato, and to Ku-Ku-Nor, west of the Yellow River. The second took him to Tchungking, Tsingliu and Moupin at the border of Thibet where he stayed six months at the risk of his life. He brought from there *Rhododendron moupinense, R. davidii, R. dendrocharis, Primula davidii, Fritillaria davidii,* and *Davidia involucrata* of which he gave one variety to my great-grandfather to disseminate and named it *D. involucrata vilmoriniana.* The third trip took him to the southwest of Pekin in the provinces of Chensi and Liu-Tchuen and to the south until he reached the mountains of Fukien. There he found *Picea armandii* and *Abies davidiana* and the unbelievably rich collection of annuals and perennials that is listed in Franchet's famous book: PLANTAE DAVIDIANAE.

If the name of Father David shines like a first-class star in the sky of French horticulture, he shares this glory with another Frenchman whose work in another direction is certainly not less important. This is Victor Lemoine.

Both were born around 1825 and both started, between 1860 and 1870, to change entirely the materials that were used in horticulture by giving to gardeners and collectors new varieties of which they did not dare to dream. During fifty years Lemoine worked on so many species with such success that it is impossible for me to enumerate all his accomplishments. First, he opened the way to the modern gladiolus by creating successively *G. lemoinei* by crossing *G. gandavensis* by *G. purpureo-auratus.* Then he created *G. nanceianus* by crossing *G. lemoinei* by *G. saundersii* and finally he produced the *primulinus* hybrids.

What Lemoine did with lilacs is not less astonishing. He created many novelties, varieties with single flowers, that were so much ahead of his time that

they are still in use. I cite as examples 'Jacques Callot', 'President Viger', 'Gloire de Lorraine', 'Pasteur', 'Reaumur', 'Paul Thirion', or 'Montgolfier'. Even more than that, by crossing *Syringa oblata* by *S. vulgaris azurea plena*, he developed *S. hyacinthiflora plena,* the first syringa with double flowers. Then he produced *S. lemoinei flora plena* from which actually all the double lilacs have been bred.

In *Philadelphus* he obtained large-flowered varieties like 'Atlas' and the first double variety with large flowers, and then the *dianthiflorus* ones...

Working on deutzias, he was the first to develop hybrids between old varieties and new ones introduced from China by Father Delavay. So he obtained *Deutzia lemoinei*, then *D. gracilis rosea, D. gracilis venusta*, *D. discolor grandiflora* and *D. gracilis carminea* and finally *stellata* and others that are still unbeaten.

Lemoine was the first to produce double tuberous begonias, and among the new and improved semperflorens or gracilis, he bred some varieties still grown in France.

He improved the montbretias, bouvardias, ceanothus and quite a good many perennials. Among the latter he was the originator of *Heliotropium giganteum* with the big bouquet of flowers, which he obtained by crossing *H. peruvianum* by *H. incanum*. He improved the astilbes by crossing *A. davidii* by *A. lemoinei* and *A. chinensis*. He bred perennial phlox, Japanese anemones, primulas, pyrethrums, and many other interesting flowers.

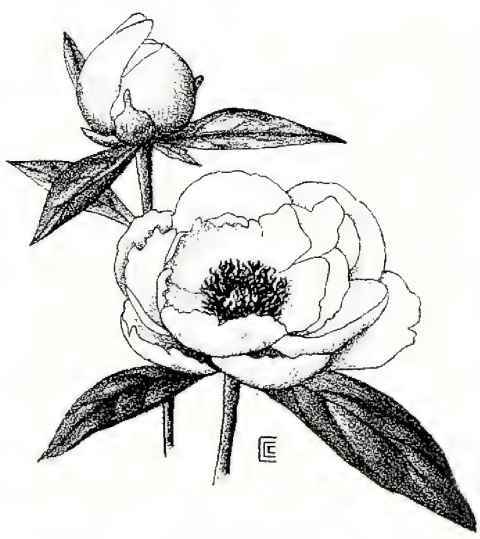
Let me remind you of what he did on peonies. By crossing *Paeonia sinensis* and *P. wittmanniana,* he created many new and interesting varieties of herbaceous peonies. Then, by crossing *P. delavayi* by *P. moutan*, he got the famous 'La Lorraine,' the first variety with large full flowers of a bright yellow.

Among all the hundreds of varieties that Lemoine obtained, many have disappeared or are kept only for their historical interest. It is the fate of breeders to have their introductions or their breeding work superseded by the work of people using the breeding material they put at the disposition of the new generation. But when we walk in gardens, both in Europe and in America, we see that many of Lemoine's varieties are still grown. Even if all his work were superseded, Lemoine would remain a legendary figure. He has been what every breeder dreams to be, that is to say, the King Midas of horticulture who, instead of changing everything to gold, changed everything he touched into new and more beautiful flowers. Maybe he had the good fortune to live at a period when this was made possible by the introduction of all those species and varieties from far away countries, but more than the good fortune, he had the imagination that allowed him to try everything, even the seemingly impossible, and to hope for something to come out of the Pandora box. His enthusiasm pushed him to try crossings between unrelated species or varieties, and it was his naive faith that allowed him to obtain so much, because he tried so much.

In France many other horticulturists have gained our gratitude:

François Cels, who introduced the lobelia, the lupine, the double philadelphus that Lemoine used for crossing, plants from the Cape of Good Hope such as tritoma, agapanthus, ornithogalum, *Gladiolus blandus, G. cardinalis,* and others. It may be of some interest to learn that it was his gardener, a man by the name of Duval, who invented the method of budding on roots which is today the only method by which millions of roses and fruit trees are propagated.

Soulange Bodin is the one who obtained *Magnolia soulangeana* by crossing *M. yulan* by *M. discolor*. He is said to be the first collector to have had a white tea rose and a yellow tea rose in his garden at Fromont, where he had a collection of over four hundred varieties of roses. He, too, invented the actual technique used in the multiplication of dahlias.



Léon Chénault has a great name in French horticulture. He was selected by my great-uncle for his really unusual ability to keep and multiply plants, and so he was put in charge, in France, of getting, multiplying and distributing all that was sent to us, by Professor Sargent of the Arnold Arboretum, that had been collected by Dr. Fairchild and by E. H. Wilson. Chénault and his son, who is following in his footsteps, introduced in France more than three thousand species and varieties. If I cite his name, though most of the plants introduced were known in America, it is because of its being a very good example of the reciprocation between France and America and of the exchange of plants and breeding material that has been going on for so long.

In French history of roses, there is a well-known name and that is Pernet-Ducher. After having obtained very striking and new varieties in the hybrid teas, such as 'Caroline Testout', 'Abel Chatenay', 'Clos Vougeot', this breeder created a new section of roses, the Pernetiana, by crossing *Rosa lutea flore pleno* by 'Antoine Ducher'. He was the one who brought the yellow color into the hybrid tea and the obtaining of the 'Daily Mail' rose, or 'Ville de Paris', were horticultural events which many at this Congress remember.

Pernet Ducher worked with E. G. Hill, the famous rose hybridizer of Richmond, Indiana, who brought Lemoine's new varieties to America. Here again is an example of cooperation between the two countries.

Another name associated with roses is Meilland. For a hundred years the Meillands have been hybridizing roses, and among the very famous varieties they have produced are two that everyone knows or has in the garden — 'Peace' and 'Happiness'.

From what we have seen we reach the conclusion that breeding is definitely an affair for specialists. It is a 10,000 to one chance of improving a variety if one doesn't know the present and future possibilities of the breeding stock and if one doesn't know what he is aiming at. Even for technicians, every step of the ladder toward improvement is difficult to climb.

In France, as without doubt in most countries, research for novelties is based principally on three techniques or a combination of those techniques. The first is classical breeding, the second is polyploidy, and the third is mutation stimulated by different rays.

Classical hybridization is, of course, the most commonly employed because it can be used for many different purposes. Either one wants to find a new plant by crossing breeding materials one knows well and is certain to get in the segregation what he is looking for. Either he uses this technique to create a certain number of "F_1's" that he can use directly because they have possibility of vegetative multiplication. Or when one is working with pure lines, he may do the crossing to get the "F_1" whose seed will be directly sown. Or it may be used to develop, for instance, resistance to some disease or rust by crossing the actual known variety by another variety having such resistance and back crossing as long as required to get the named variety with this new character.

Polyploidy is, in a way, the most attractive because it is the safest of all, but it needs highly specialized technicians because of the great number of traps that are open under the feet of breeders. I refer to the frequency of chimeras or sterility or difficulties of reproduction for plants that multiply by the roots. More than that, most of the things obtained through this process are monsters without any horticultural interest.

Such is also the case for many of the results of artificial mutation. In fact, this method is rather deceiving, mainly because breeders do not know how to utilize it in the direction they want. In a way, it is still a matter of luck that a ray will hit a gene, or a part of a gene, at the right period of multiplication of the cell . . . There have been so very few interesting results that many of us would have given up using artificial mutation, if we were not pushed by a kind of costly curiosity to see where the most modern of the methods will lead us . . .

All these methods have this in common, that it is impossible to foresee exactly the result of the work even when statistical preparation and knowledge of the parents allow us to reduce the number of bad risks. And then,

after getting new plants, the experimentation poses new moral and financial problems. The finding of new plants does not proceed without an enormous waste of technique and money, and it is certain that most of the private breeders would today have ended their work if the protection of the breeders' right or patents had not been generally accepted and did not bring part of the money they need to continue with their research. The efforts of Francis Meilland for plant patents in Europe helped greatly a good many plant breeders.

Now that I have spoken about the past and the present, I shall tell in a few words how I see the future in France.

I believe in research for novelties, because novelties possess glamour and are a very powerful stimulus to interest in horticulture...

I believe that the time will come when the importance of botanical gardens will be so great, partly because of fewer collectors and the disappearance of many collections, that almost every city will have to have a collection of all the important botanical materials. It will be for students, it will be for the general instruction of the public, and it will be, too, for future breeders to help them with the unusual plants they need. What should these future breeders try to reach in their work? In my opinion, they will have to disregard the slight differences of size or color, of shape of the flowers or this and that, and breed plants that will please the public either for indoor or outdoor use. This means healthy plants, long-flowering plants, nicely colored plants, disease-resistant, frost-resistant plants. . . . we regret that we don't see enough cut flowers in houses. But when we have roses that, grown by serious professional growers, will last two or three weeks in vases, one may predict that roses will be used ten or twenty times more than they are today. This is, in fact, what happened in France where the popularity of small chrysanthemums as cut flowers soared very high just because they last long in apartments. The number of plants for which this improvement is desirable seems to me enormous, for instance, dahlias, anthemis, delphiniums, lupines, peonies . . . the idea that people will use more flowers if they die more quickly is one of those absurdities too absurd to be discussed.

Outdoor plants, I believe, will be mainly used: first, in the little gardens with no professional help and, second, in parks or public gardens, factory gardens, school and university gardens. We shall return to a certain extent to where we stood when we had those big gardens of the seventeenth and eighteenth centuries in France. In these future gardens landscaping will be most important and will create perfect settings for the flowers that will be used in masses but chosen mainly for the general qualities of the plants rather than their rarity.

If I foresee rightly the same plants will be used in these two categories of gardens, because people will go to the public parks to get ideas about plants and colors, and, not being technicians themselves, they will have to be shown all the plants they can use, to be successful in the making of their own gardens.

That's why, without pretending that these public gardens will be gardens of Eden, I am convinced that breeders will have a very important part to play in the orientation of the social life. A French writer wrote a few years ago: "One does not understand anything of modern life, if one does not admit first that it is a universal conspiracy against every kind of spiritual life." I admit it is more so in Europe than it is in the United States, but it is a danger everywhere. By

(Continued on page 29)

Mrs. Roy Arthur Hunt is standing in the gate to the garden of her home in Pittsburgh, Pa. (Frontispiece in Volume 1, reviewed here.)

CATALOGUE OF BOTANICAL BOOKS IN THE COLLECTION OF RACHEL MCMASTERS MILLER HUNT. Volume I. Printed Books 1477-1700. With several manuscripts of the 12th, 15th, 16th & 17th Centuries. lxxxiv; 517 pages. Compiled by Jane Quinby. The Hunt Botanical Library, Pittsburgh, Pennsylvania. 1958. Distributed by The L. H. Bailey Hortorium, Cornell University.

A REVIEW

By William Campbell Steere

Dr. Steere is the Director of The New York Botanical Garden.

FOR MANY YEARS, now, the Rachel McMasters Miller Hunt Botanical Library has been to all botanists and students of botany, both amateur and professional, an almost legendary treasurehouse of books about plants—books that stand as botanical landmarks, magnificently illustrated books, and books so rare as not to exist elsewhere in North America. Although long familiar with the legend of this wonderful collection, I became acquainted with part of it, at first hand, just ten years ago, when Mrs. Hunt most generously loaned a selection of fifty-five books for exhibition in the Clements Library at the University of Michigan, on the occasion of the Summer Field Meeting of the Botanical Society of America in Ann Arbor. In Bulletin LVII of the Clements Library, "Fifty-five Rare Books from the Botanical Library of Mrs. Roy Arthur Hunt" (August, 1949), a handsome brochure prepared to accompany this breath-taking exhibition, Professor Harley H. Bartlett described the books in bibliographer's terms and gave pertinent information about their origins and their authors. Because of my background of active interest in the Hunt Library, I have been all the more impressed with the magnificent volume reviewed here, the first of a series of three.

In a charmingly modest preface, Mrs. Hunt outlines much too briefly the development of her interest in botanical books and her activities in collecting them. Her circle of friends among botanists, bibliographers, and scholars in general is astonishingly wide, as reflected by her special section of acknowledgments to so many different individuals. Although Mrs. Hunt does not give herself sufficient credit in her preface, or elsewhere, her great accomplishment in bringing together an almost incredible collection of books, her consuming interest in botany, botanical bibliography, and botanists, and her active participation in the preparation of this volume shine forth from every page.

The "Introduction" consists of four illuminating essays. The first, "Botany from 840 to 1700," is a thoughtful and scholarly treatment by Dr. Harold William Rickett, Bibliographer of The New York Botanical Garden. Dr. Rickett has skillfully woven together the historical trends and the streams of botanical activity that eventually brought about the birth of modern botany, illustrating the progressive steps with the most appropriate books. His annotated list of nine general references is recommended to those who wish to read further. In a very brief essay, "Medical Aspects of Early Botanical Work," John Farquhar Fulton, M.D., Sterling Professor of the History of Medicine at Yale University, emphasizes the importance of the medicinal uses of plants — and of the herbals that specified these uses—on the development of modern botany. Dr. Paul Bigelow Sears, Chairman of the Conservation Program at Yale, in a thought-provoking essay, "The Dawntime of Modern Husbandry," brings his interests of exceptional breadth to bear on the effects upon agriculture of wars, of social systems and their change, of racial and national techniques and practices, of feudalism, of the vast land holdings of religious groups, and of social and historical forces. Finally, Professor Wilfrid Blunt, A.R.C.A., of Eton College, Windsor, analyses "The Illustration of Early Botanical Works" with scholarship and authority, and also with the sensitive perception of an artist. The twenty-four collotype plates at the end of the volume may be studied with benefit in conjunction with the reading of this essay.

A separate "Bibliographic Survey," "Printing in the 15th and 16th Centuries as Represented in the Hunt Collection; with a Note on the 17th Century," has been contributed by Dr. Margaret Bingham Stillwell, Librarian Emerita of the Annmary Brown Memorial in Providence and Professor Emerita of Bibliography, Brown University. She has brought together in a highly readable manner much fascinating information on history and botany as they relate to the printing of early books. This chapter is a "must" for anyone interested in the early beginnings of botany, as too few of us fully realize the very real influences of economic, political, and religious upheavals at home and of imperialistic and military ventures abroad on the velocity and direction of today's botany. The account of organized strikes by printers for higher wages and better conditions, strikes that began in 1539 and occasionally stopped the production of botanical books during the next thirty years, may remind the reader somewhat uncomfortably of much more recent events!

The Catalogue itself, the main body of the book (517 pages), is introduced by an "Explanation of Catalogue Method" by Jane Quinby (compiler of this volume and Librarian of the Hunt Collection), as well as by a list of "Earliest Authors and Anonymous Works from Hippocrates to the Invention of Printing." The 402 entries in the Catalogue, beginning with Macer's FLORIDUS DE VIRIBUS HERBARUM CARMEN, *ca.* 1150, and ending with Nourse's CAMPANIA FOELIX, 1700, are arranged in a strictly chronological order. Reflecting much careful research, the description of each entry furnishes the following essential information: 1) date; 2) author's name, dates, and brief biographic material; 3) generic title; editor or translator;

(Continued on page 7)

DOUBLE GLOXINIAS NEW AND OLD

By **Paul Arnold**

Mr. Arnold is registrar for the American Gesneria Society and international registrar for the plant family *Gesneriaceae* (excluding *Saintpaulia*). He specializes in growing gesneriads in Binghamton, New York.

ONE OF THE popular home garden magazines accepted for publication in its January 1959 issue the advertisement of a South Carolina nursery firm which proclaimed *"the first and only Giant Double Gloxinias."* The attention of the editor of that periodical was called immediately to the fact that his own pages, ten months earlier, had carried a contradictory advertisement by a New York State mail-order concern claiming they had *"The world's first and only Double Flowering Gloxinias."*

The editor, unabashed concerning his part in this deception, made no effort to correct either the contradictory priority claims or the fundamental error made by both advertisers. Neither firm, as a matter of fact, had the *first* or the *only* double-flowering gloxinias to be offered to the public.

Exaggerated advertising claims are traditional in horticulture. The experienced reader soon learns, by expensive trial and error, to translate "earliest" into "fairly early," to scale down "everblooming" to "blooms over a long period of time," and to make proper allowance for over-enthusiastic inaccuracies such as "new" for a plant like *Aeschynanthus pulcher*, which was described and named in 1837, grown extensively in western Europe before the turn of the century, and only recently offered for sale in the United States. The Congressional Committee on Legislative Oversight has not seen fit to question the *never never or hardly ever land* of horticultural advertising, and perhaps the tradition of exaggeration is too well known to plant and seed buyers to require such inquiry in the public interest.

Gloxinia growers recently have shown a definite but rather wary interest in the current advertising. This wariness may, perhaps, not be due entirely to the remembrance of previous encounters between horticultural innocence and commercial fiction. Some growers had never before heard of double-flowering gloxinias, just as the advertisers had hoped. In other cases, the growers had encountered petalody in their own plants from time to time. They chose to "rogue" out such irregularities from their cultures rather than to develop them into more fully double flowers by selective breeding. Other gloxinia lovers simply think the open chalice of a beautiful gloxinia is a thing of surpassing glory to which additional petalage would be a detraction. Still others, noting the current interest in such novelties, and challenged by the statements that such flowers are a tremendous breeding accomplishment, went to work and produced double-flowering gloxinias.

THE PULLEN DOUBLE GLOXINIAS

The double gloxinias, offered in March 1958 by one nursery and in January 1959 by another nursery, came from the same wholesale market grower, Col. Joe Pullen of Houma, Louisiana. The Pullen Double Gloxinias were first offered for sale in the United States in the autumn of 1957 by the Vaughan Seed Company of Chicago and New York. This offering appeared in their autumn 1957 wholesale catalog or "Book for Florists" and listed plants of two types: Gorgeous Double Red and Gorgeous Double Red and White.

The following spring, in the March 13, 1958 issue of the weekly FLORISTS' REVIEW, a Vaughan advertisement offered these same plants under the names Super Double Red and Super Double Red and White. The additional information was given that they had forty-five to fifty petals to a flower. That claim for petal count, however, has not been repeated in succeeding Vaughan advertisements for obvious reasons. The designation Super Double, however, has been continued as a replacement for the term Gorgeous Double.

Vaughan's Seed listed Double Dark Blue in the spring of 1959 and changed it to Double Blue in their autumn 1959 list. The Double Red and White was not offered after the autumn 1958 occurrence. Only two types, Double Red and Double Blue, were shown in the autumn 1959 list, where there also appeared, for the first time, a statement that they produce "approximately sixty-five to seventy percent true doubles."

The beginning of doubleness in a gloxinia flower was reported as early as 1845, when this picture was taken in England. The Floral Committee of the Royal Horticultural Society viewed a number of such flowers without enthusiasm.

THE ORIGIN OF PULLEN DOUBLE GLOXINIAS

Colonel Pullen has been described as a hybridizer, and the first man to produce double-flowering gloxinias. However, individuals who have visited his nursery at Houma, Louisiana, report that Col. Pullen very freely discusses the origin of the plants he grows, states that he imports the seed from Europe and has an exclusive arrangement to do so.

Nevertheless, the idea that double gloxinias are of recent American origin is growing as a legend, fostered by florists' sales promotion. An example is the Geo. W. Park Seed Co. "Flower Book Planting Time Supplement," a publication which bore only the date 1958, but it was mailed about the first of March, according to Geo. B. Park. In this catalog is found the following:

> *Giant Double Flowering Gloxinias*
> We proudly present this Horticultural Triumph while it is almost too new to be true . . . . Mr. Joe Pullen of Houma, La., has performed a near miracle, a hybridizing feat here-to-fore thought to be impossible. He has discovered the secret and produced the first and only Giant Double Gloxinias known to Floriculture.

Disappointed that the plants which they received from Col. Pullen were not one hundred percent double, the Park Seed Co. selected some of the better double-flowering plants and propagated them vegetatively. Such guaranteed one hundred percent double gloxinias were offered by Park early in 1959 under two cultivar names: 'Jack O'Diamonds' and 'Monte Cristo'. The first one was described as a light scarlet flower with white edge, and 'Monte Cristo' was pictured as an all-red flower. In November 1959 a third cultivar, 'Blue Chip', was offered in Park's national advertising which described it as deep royal blue in color. This name was changed to the plural form 'Blue Chips' in Park's December 1959 advertising, and a fourth cultivar name was added, 'Royal Flush', described as blue and white.

Efforts to learn who really did develop the seed lines, that produced and currently maintain the Pullen Double Gloxinia strains have not been well rewarded. Letters addressed to Col. Pullen have gone unanswered. The firm in Zürich that supplies the seed to Mr. Pullen was contacted. It feels that secrecy is required to protect from exploitation by rival seed houses its endeavors over the years to establish and maintain a source of supply for double gloxinia seed. This firm points out that it has found it difficult to locate, in Switzerland and in other countries, growers who not only could produce the double gloxinia seed but who would produce it consistently and dependably in the required quantity.

Consistency and Persistence of Doubling

The dependability of the Pullen Strain of Double Gloxinias with respect to its consistency in producing double flowers has been a matter of interest to growers. Geo. W. Park, as noted above, dropped the seedlings entirely from their catalog to avoid disappointing their customers. Instead, they offer only the more expensive, vegetatively produced plants to insure one hundred percent double flowers.

The only grower known to me who has received seed from Col. Pullen has found less than thirty percent double flowers in his cultures. Pullen Double Gloxinia plants grown at Cornell University produced about fifty percent double flowers. Although Vaughan's Seed Company advertised sixty-five to seventy-five percent double-flowering plants, R. Milton Carlton of that firm reported that some lots of Pullen Double Gloxinia plants which they flowered "have produced as high as eighty percent doubles" in their test center at Wheaton, Illinois. The source from which the seed was obtained in Switzerland states, "Only approximately forty percent are really double flowering."

Some alert growers, including Col. Pullen, have noted the influence of cultural practices on the production of double flowers. It appears that an excess of nutrient is more effective than near-starvation in producing double gloxinia flowers. If particular minerals in the food supply of the plants have an influence on double flower production, one way or another, there does not appear to have been any systematic determination of such effects and no reports of such findings in the horticultural literature have been noted.

Experienced growers have noticed that double-flowering tendencies have appeared from time to time in their gloxinia plants, only to disappear and seldom reappear when the same tuber is brought back into flower the second year. A few individuals who purchased double gloxinia plants from florists have complained later that the tubers produced only sin-

A silver medal as well as first prize for an undisseminated sport or hybrid was won at the 1959 New York International Flower Show by one of these Thompson Double Gloxinias.

gle flowers when restarted from dormancy. All these happenings seem to be manifestations of the natural variability of the *Gesneriaceae*, a well-documented characteristic which is the delight as well as the despair of the growing legion of gesneriad fanciers.

Double Gloxinias of Former Years

Before the surprise appearance in 1845 of gloxinia Fyfiana, the first one to have upright flowers, all gloxinias were of the nodding type. It is not surprising, therefore, that the earliest account of a double gloxinia deals with one of the so-called "slipper" or drooping varieties. Writing about it in the Journal of Horticulture, Cottage Gardener, and Country Gentleman issue of February 2, 1864, the editors, George W. Johnson and Robert Hogg, made an observation which is being echoed more or less by gloxinia growers today, as they note the fuss that is being made about double-flowering types.

> To Correspondents. Double Gloxinias. (Rev. A.F.).— we know of no reason why gloxinia flowers should not be obtained double, for other campanulate corollas are so transformed. The accompanying is the commencement of such a change, and is the portrait of one of several similar flowers exhibited before the Floral Committee of the Royal Horticultural Society. We agree with the Committee in thinking it no improvement to the flower.

A decade later, Thomas Veitch and Sons of Chelsea, in London, apparently marketed two cultivars of upright flowering double gloxinias, sometime before 1877. In his catalog for 1877, the Belgian nurseryman, Louis de Smet of Ledeberg-lez-Gand, listed 'John Gray' and 'Lady Cremorne', describing them as "double corolla."

Two years later, Louis Van Houtte in Belgium and Anthony Roozen & Sons in Overveen, near Haarlem, Holland, listed these same double-flowered gloxinia cultivars in their respective catalogs. Van Houtte's 1879 price list attributed both cultivars to Veitch and identified them as upright flowers. In describing 'Lady Cremorne', he speaks of "a new type of flower adorned with an elegant, lively rosy and white tucker inside of throat, very lively dark rose." Apparently no other nurserymen took up these novelties, either in England or on the continent, and they soon disappeared from catalogs.

All American Double Gloxinias

Both upright (Fyfiana) and nodding (Maxima type) double gloxinias were shown at the 1959 New York International Flower Show. At the 1958 show there had been two or three entries of Pullen Strain Double Gloxinias. The 1959 entries were noteworthy not only for the fact that both upright and nodding flowers were shown, but also because these double gloxinia plants had been bred in the United States by Bruce A. Thompson of Philadelphia.

The Thompson Double Gloxinia flowers are generally red or rose-colored. Some have a red limb and white corolla tube. All are completely double flowers of the "hose in hose" type that is familiar in campanulas. A Thompson Double Gloxinia flower, red with white tube, which I examined, had a six-part calyx, a six-lobed outer corolla, and a seven-part inner corolla. The outer corolla was unadorned, but the inner tube had three partly developed petals on its outer surface and four similar "tuckers" on the inside; all of them in different stages of under-development. This flower lacked a perfect style, but it had a multiplied organ composed of six fused shafts, one of them showing petal color at its tip. There were in the disk five glands of normal form plus one broad three-lobed gland of unusual form.

Mr. Thompson also has produced a double gloxinia with deep purple limb and tube of paler color. A flower of this type showed two complete corolla tubes of six lobes each, a six-parted calyx, and six glands in the disk. In addition to an apparently perfect style and stigma, there was a second "style" composed of five or six columns fused together and ending in imperfect stigmas. None of the Thompson Double Gloxinia flowers, of course, have any filaments; those organs have been developed into petalage.

Mr. Thompson, who grows his plants in the basement of an apartment building, under fluorescent lights, started with a Pullen Double Gloxinia plant. He fertilized the double flower with pollen from a Thompson Hybrid Gloxinia selected from one of the distinctive strains he had successfully developed during the past several years. Mr. Thompson is a hobbyist grower who does not sell plants or seed, but there is a possibility that one of the house plant nurseries dealing in gesneriads may offer the Thompson Double Gloxinias for public sale in the near future.

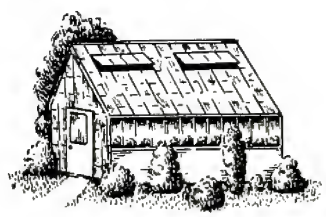
In Warsaw, New York, Henry Ten Hagen, the African violet grower, has produced a strain of double-flowering gloxinias by fertilizing a Pullen Double Gloxinia having red and white flowers by means of pollen from a blue-colored Buell Hybrid Gloxinia. People who have seen the resulting population consider them attractive. Steps are being taken to build up a sufficient stock of the Ten Hagen Double Gloxinias so that they can be offered commercially.

A REVIEW (from page 4)

place, printer, date; number of volumes; 4) title-page; 5) collation; 6) description of the Hunt Library copy; 7) published references and location of other copies; and 8) explanatory notes. Needless to say, this Catalogue is truly a mine of bibliographic information for all time.

The "Appendix" describes fifty-six important early books that have appeared as reprints or transcripts or in facsimile form since 1700. Volume I ends with an extensive bibliography of reference books; twenty-four well-selected collotype plates of illustrations and title-pages arranged in chronological order and related by number to the corresponding entry in the Catalogue; and an unusually comprehensive Index.

This reviewer would be committing a crime of omission if he did not mention the beautiful appearance of the book itself. The composition and presswork by The Anthoensen Press, on excellent, specially watermarked paper, is outstanding for its aesthetic quality and its accuracy; the binding is not only handsome but also sufficiently sturdy even for a reference book that must withstand as much use as this one will obviously receive.



Wallacea insignis Spruce ex B. & H. is a common shrub with pink-eyed white flowers along both Caño Temi and Caño Pimichín. The generic name is a token of Richard Spruce's friendship.

A Historic Portage

By J. J. Wurdack

A Description of Javita

'Tis where the streams divide, to swell the floods
Of the two mighty rivers of our globe;
Where gushing brooklets in their narrow beds
Lie hid, o'ershadow'd by th' eternal woods
And trickle onwards,—these to increase the wave
Of turbid Orinooko; those, by a longer course
In the Black River's isle-strewn bed, flow down
To mighty Amazon, the river-king,
And, mingled with his all-engulfing stream,
Go to do battle with proud Ocean's self
And drive him back even from his own domain

Alfred Russell Wallace

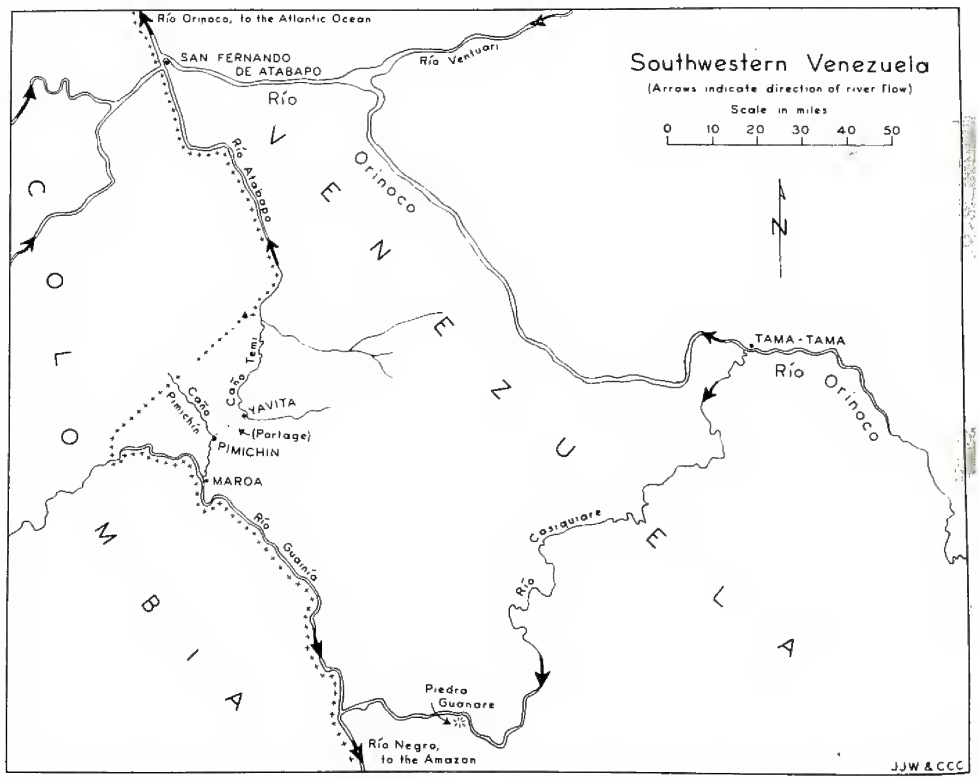
Dr. Wurdack is Associate Curator of The New York Botanical Garden.

Last year was the centenary both of the death of Alexander von Humboldt and of Darwin's and Wallace's joint publication of a theory of evolution by natural selection. Symposia were held in various parts of the world in observance of these anniversaries. For Humboldt, Wallace, and other pioneer naturalists, one common path in their tropical travels was the portage between the Orinoco and Río Negro drainages in southwestern Venezuela. In their travel writings, both Humboldt and Wallace dwelt at length on their experiences in this region, and undoubtedly their ideas on the tropics were strongly influenced by their stays on the height-of-land.

The Orinoco River describes a gigantic arc of some three hundred and fifty river miles between Tama-Tama and the mouth of the Meta River. Because of the reversal of the Orinoco's course, the all-water trip from San Fernando de Atabapo to the Río Negro via the Río Casiquiare (about four hundred and twenty-five river miles) involves twice as much time as the Río Atabapo —Yavita to Pimichín portage — Río Guainía route (about two hundred miles). Between Caño Temi and Caño Pimichín, the height-of-land is only eleven miles wide, the terrain flat. Indeed Humboldt proposed to King Charles IV of Spain the building of a canal between the drainages to facilitate development of the upper Orinoco–Río Negro area.

For the last one hundred and sixty-four years, the approach from the Orinoco has been the Río Atabapo and its affluent, Caño Temi, to the insignificant port of Yavita. From the Guainía, the sinuous course of Caño Pimichín is followed from just above Maroa to the landing at Pimichín. Both approaches are through flat land with scrub forest and savannas, which are inundated during the rainy season. Inexplicably the entire area is considerably cooler and rainier than the adjacent Orinoco-Casiquiare region. The walk across the portage is predominantly through high rainforest.

Apart from the saving of time, in daily ease of living the portage route has the great advantage of being free from the biting blackflies which becloud the upper Orinoco and Casiquiare Rivers. Thus the short cut immediately became popular among the Portuguese who had been across the divide about 1755. During the middle of the eighteenth century, both Spain and Portugal

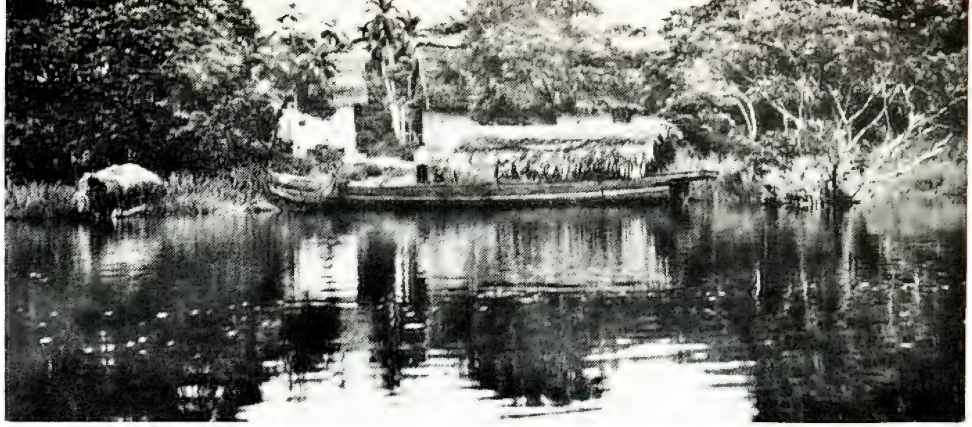


were attempting the consolidation of their respective claims to the Alto Orinoco. Yavita, an Indian chief from the Río Caquetá, came to Caño Temi about this time, ostensibly to propagandize for the Portuguese territorial and spiritual claims, but actually (according to Humboldt) to collect slaves. After being captured by the Spanish conquistador Solano, he was converted to the Spanish cause and the town named for him was established in 1756. The old chief was still alive when Humboldt and Bonpland arrived in Yavita on May 1, 1800; the portage road had been constructed only five years before.

At the time of Humboldt's arrival from San Fernando de Atabapo, Yavita had a Spanish monk in residence among one hundred and sixty Indians. (The 1959 population of Yavita was about thirty, including an outpost of the Venezuelan Guardia Nacional.) The two naturalists remained there several days while their dugout was rollered across to Pimichín; they then proceeded downstream to the Río Guainía on May 8. A welter of impressions and observations were recorded by Humboldt; at Yavita was first seen *cupana*, the source of a popular tropical drink; the botanical source of *curare* was first collected at Pimichín; *jigua*, the edible fruit of a *Caryocar*, was sampled at Pimichín; the abundance and lethal effects of the *mapanare* (fer de lance) made a deep impression on the "last of the universal men." The eighty-five curves of Caño Pimichín Humboldt rated second only to the windings of the Chagres River. While in the portage's high forest, the envy of a tropical plant collector was well expressed by Humboldt: "What we could gather appeared to us of little interest compared to what we could not reach."

Wallace's long approach to Yavita was from the Amazon and Río Negro. He arrived at Pimichín on February 1, 1851, and at Yavita on February 18. Here he remained collecting specimens (chiefly insects) until March 31. Like Humboldt, Wallace's details of a black jaguar, fish poisons, *mapanares*, and *chiquichique* are an indicative record of the shaping of a great mind. The concrete evidence of his sojourn survives only in his writings. The ship on which he and his large collections were

(Continued on page 13)



Yavita today is even smaller than in Humboldt's time.

Chiquichique palm fiber (from *Leopoldinia piassaba* Wallace ex Archer) is still an important natural product of the Guainía-Atabapo area, as it was in Wallace's time. It is exported to the United States and Europe for brooms and whisk-brooms.

The high forest along the portage is very rich in plant species.

PALAEOBOTANY at The New York Botanical Garden

By **Herman F. Becker**

Dr. Becker is Visiting Research Associate at The New York Botanical Garden and, under a grant from the National Science Foundation, is continuing his research on the Tertiary Ruby flora of southwestern Montana.

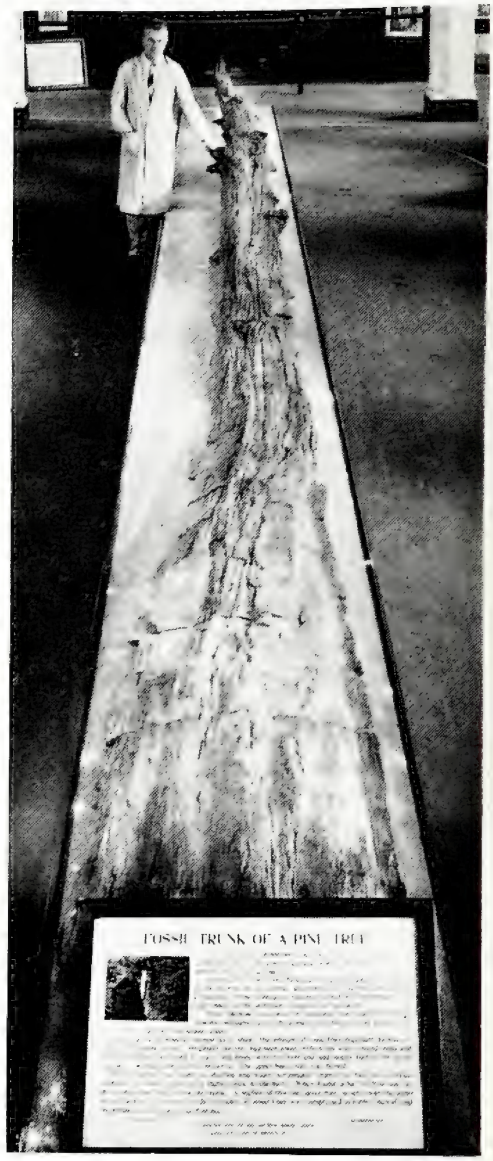
PALAEOBOTANY, in recent years, has finally outgrown its adolescence as evidenced by the ever-increasing number of professional publications, attendance at botanical and geological meetings, the addition of courses, and the concurrent emphasis on streamlined exhibits in the various universities and museums of this country.

The New York Botanical Garden is fortunate to possess as a basic collection one of the finest and most diversified accumulation of classical fossil material. Much of this wealth was assembled and published under the able curatorship of the late Dr. Arthur Hollick. Unfortunately, this material has lain dormant for the past twenty-five years and was permitted to accumulate dust in relative oblivion.

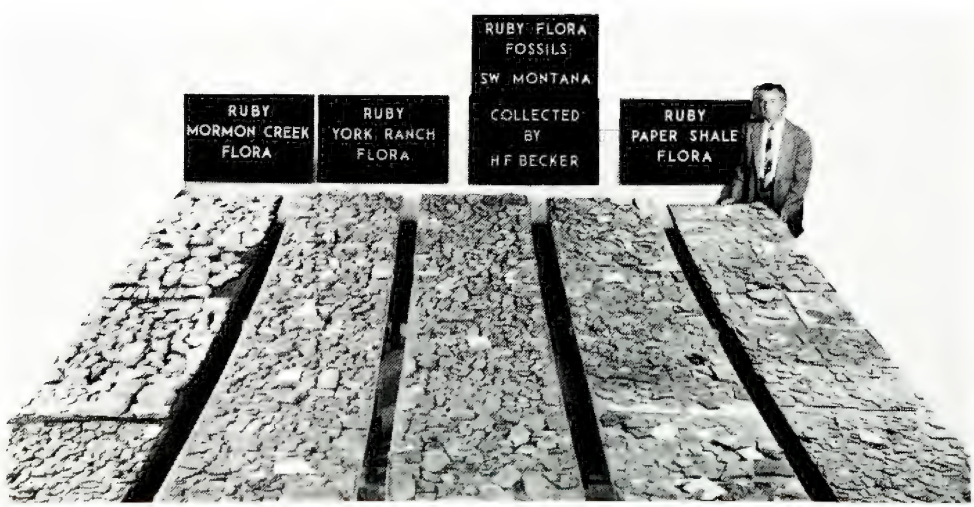
A generous research grant from the National Science Foundation now permits a revitalization of "fossil" interest at the Garden as well as my own continued investigations of the Tertiary Ruby flora from southwestern Montana. Existing collections in the Botanical Garden museum are to be made available for study, loan or exchange, and displays will be modernized and expanded to suit educational requirements. Before such an ambitious program can be realized, however, a hitherto non-existing specimen record must be created. When one considers the need for an estimated ten thousand typewritten index cards, the implications regarding time and effort for such an undertaking become self-evident.

Judging by recent trends, macro-palaeobotany, the study of fossil leaf and floral structures, is rated second to its latest offspring, palynology, the science of pollen study. From an economic point of view one may consider palynology worth more in dollar returns, since this study may be successfully applied to certain phases in oil geology. As a contribution to basic science, however, to the evolution of flowering plants, to the knowledge of leaf shape and variability, and to say nothing of aesthetic aspects, macro-palaeobotany elicits a considerably greater botanical value from its study and result.

The inherent fascination of exploring unknown fossil floras, adding to the range of described as well as to the knowledge of new species, and of presenting their botanical, ecological, and evolutionary implications to the interested student and reader, caused me to delve into floral secrets of the Tertiary Ruby basin in southwestern Montana. Ever since my discovery of this assemblage in 1947, new specimens and species were added during six successful seasons in the field. Last September this area, on the fringe of the West-Yellowstone-Madison-River region, became notorious because of the disastrous earthquake. Such phenomena undoubtedly occurred many times during the geologic past, for the collecting ground is traversed by countless faults and shows other old and recent evidence of volcanic activity. The fossil sites yield an apparently inexhaustible wealth of plant and insect remains together with fishes, aquatic larvae, snails, feathers, and even an entire bird. Within two miles on the same pediment, bones of Miocene camels and horses were found. This diversified flora and insect fauna ranges from the Paleocene through the



The upper, forty-foot portion of a silicified pine trunk which was more than twice as long. This Cretaceous tree, at least seventy-million years old, was donated by the American Museum of Natural History.


RUBY MORMON CREEK FLORA
RUBY YORK RANCH FLORA
RUBY FLORA FOSSILS SW MONTANA COLLECTED BY H F BECKER
RUBY PAPER SHALE FLORA

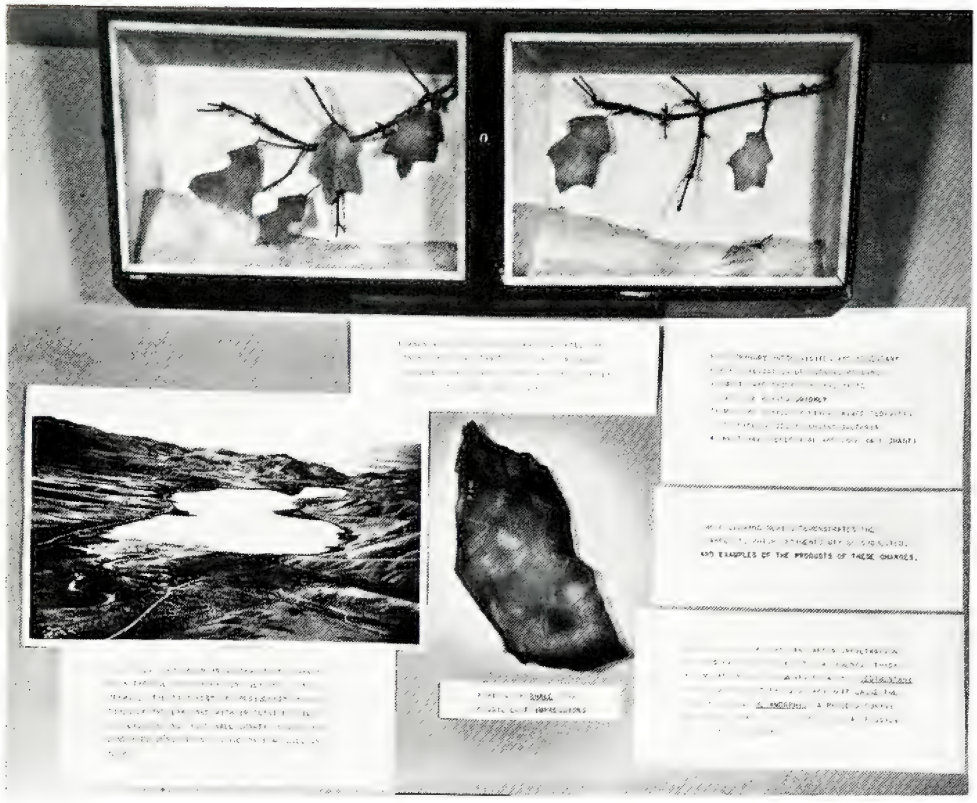
The author's 1959 collection of approximately five thousand specimens of Tertiary fossils from the Ruby flora in southwestern Montana, representing about two hundred species of plants, insects and fishes.

Aerial view of the northern portion of the upper Ruby basin in southwestern Montana with fossil plant localities on the beaches in the left foreground.

Miocene, but specimens of the Oligocene age are most abundant. Floristically the paper shale phase of the assemblage is very similar to that of the Florissant flora in Colorado with which it has a forty-two percent identity. In addition, the occurrence of many species extends the range of ancient known plants, connecting the Florissant area via the Ruby region with certain fossil floras in Oregon and other western localities, thus uniting them in a common botanical province.

A typical day in the field during June to August is largely determined by the climatic factor. An average annual rainfall of from twelve to fourteen inches, with most of it during the winter and spring, results in semi-desert conditions during the summer. In the draws and drywashes on the pediments or benches that contain the fossil sites, temperatures often fluctuate between 90° and 120° in the sun, but the relative humidity is low. Except under an occasional solitary juniper tree shade is lacking, and in the usual absence of a breeze, reflection from the light-colored shale and sand increases heat and glare. Thus it becomes imperative to work the sites from sunrise to noon, and perhaps again during the late afternoon hours. Excepting the everpresent, noisy magpies and the soaring red-tailed hawks, life on the benches is restricted to antelopes, rabbits, mice, rattlesnakes, and insects. Greasewood, sagebrush, opuntias, bitter-roots, and a host of desert plants, including sparse grasses, thrive under these conditions. Cattlemen complain that it takes twenty-five thousand acres of this type of range land to feed one thousand cattle. Permanent streams are few and far between, and drinking water must be brought in from a distant ranch. Cataloguing, trimming, wrapping, and packing of specimens, as well as more intellectual pursuits, are relegated to the compara-

The author is demonstrating the packing and means of transportation of some paper-thin fossil shales, which are placed in cotton-lined Riker mounts.

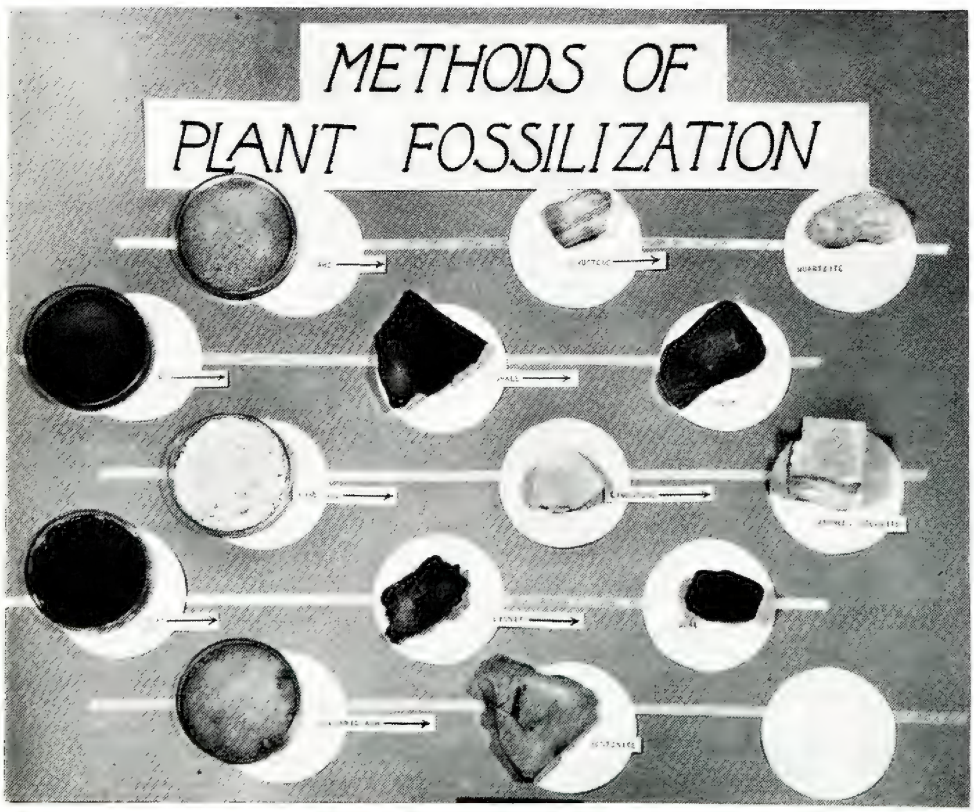


New, permanent exhibit demonstrating methods of fossilization—

Above. Burial of leaves and factors required in fossilization.

Below. Types of sediments and rocks which favor preservation of fossils; the series is one of progressive alteration.

Top, page 13. Rocks which never contain fossils, and the preservation of organic debris, including pollen, as constituents of peat and lignite.



tive coolness of the evening hours. Night temperatures, ranging from 40° to 60°, with an occasional dip to 28°, offer welcome relief, sometimes tempered, however, by an invasion of mosquitoes from the not too distant Ruby River bottomlands.

All fossil sites are located within three square miles on the benches abutting on the Ruby range. It is fortunate that they occur near the surface or on the walls of dry, V-shaped creek beds. Removal of an occasional overload or talus by bulldozer has proved successful. Most of the fifteen fossil sites consist of paper shale, and some of white or brown silty material composed of re-worked volcanic ash. This extremely fine material permitted faithful reproduction of the most delicate plant or insect structures in the form of darker imprints. Upon being split, the slabs of shale yield counterparts or mirror images of organic remains. During the past twelve years approximately ten thousand specimens were collected, among them many species new to science. The flora is interpreted as an early- to mid-Tertiary, semi-arid and temperate assemblage. Thus ferns are rare, gymnosperms more frequent, and angiosperms by far the most numerous. Among evergreens we find pine, spruce, fir, *Glyptostrobus*, and *Metasequoia.* The deciduous flora consists of a predominant streamside element, open forest trees and shrubs, and some xeric representatives including perennial herbs. Nearly all forms have living representatives in North America and Asia, whose structural parts, such as leaves, bracts, calyces, flowers, fruits, and seeds may be identified through living or herbarium material.

In relation to other known fossil floras, the Ruby assemblage promises to become one of the most extensive, regionally restricted floras in this country. The majority of specimens will be incorporated in The New York Botanic Garden fossil collection, thus extending its scope and value as an active source for study. As the only collection of its kind in New York City, it is to be hoped that it will stimulate anew this phase of basic botany, that forthcoming publications and publicity will also thaw the budget and good-will of our City Fathers, and induce them to provide permanent sustenance for this endeavor.

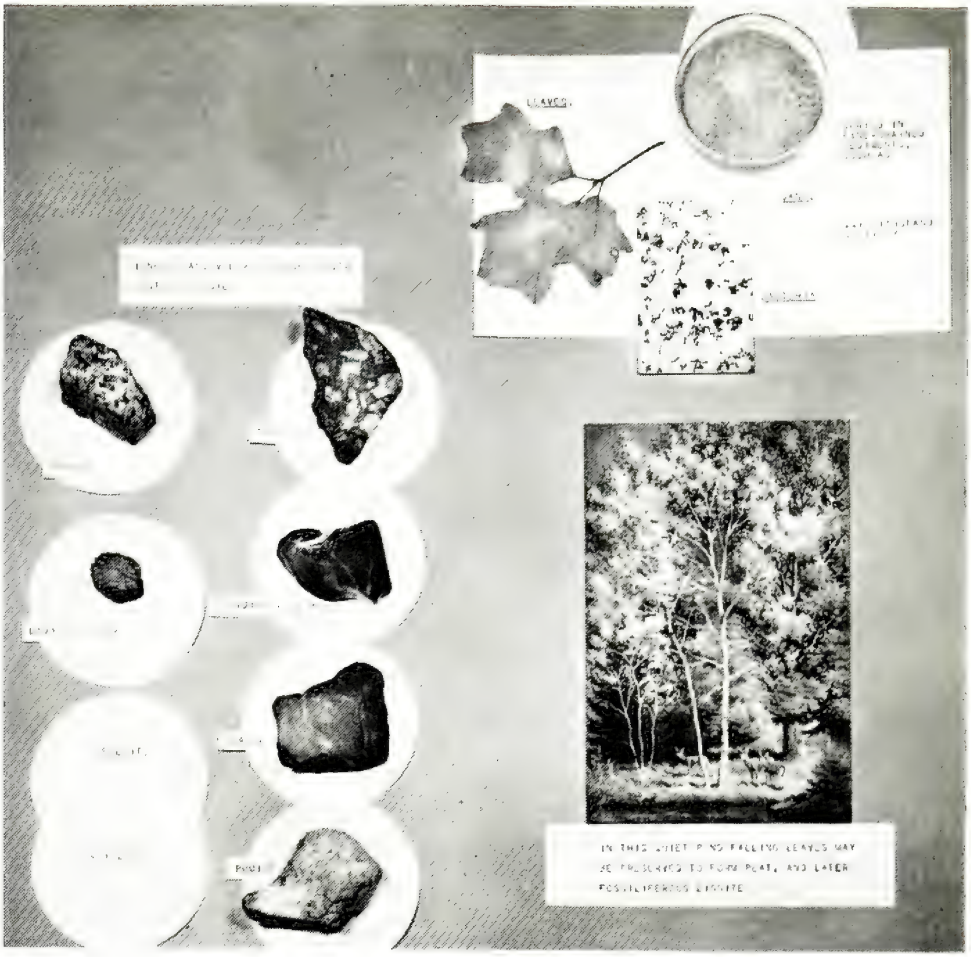
PORTAGE (from page 9)

returning to England caught afire in the Atlantic on August 6, 1852; while Wallace survived nine days adrift in a lifeboat before being picked up by another ship, all his specimens were lost.

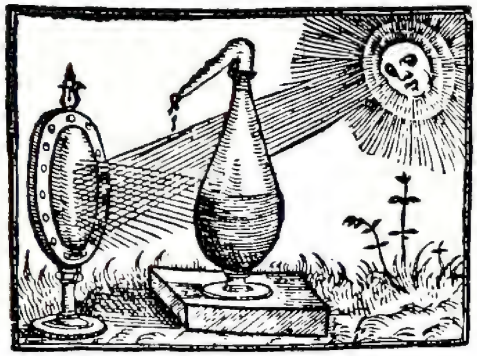
Wallace is cruelly neglected in the plaudits of the modern scientific world. Darwin recognized a peer in the great field naturalist and said: "You are the only man I ever heard of who persistently does himself an injustice, and never demands justice. But you cannot burke yourself, however much you may try." Wallace had not only infinitely greater field experience than Darwin and opportunity for personal observation in fitting together the evidence for natural selection, but was also a person of much more diversified interests. He published tracts on economics, land nationalization, spiritualism (in the Victorian sense), and vaccination. One of his final efforts was editing the travel notes of his good friend, Richard Spruce.

Spruce was the last of a renowned nineteenth-century natural history triumvirate to visit the portage. He reached Pimichín on June 10, 1854, and proceeded to Yavita the next day. He was at the far end of his lowland travels from the mouth of the Amazon and also on the verge of the severe fever, that later incapacitated him for thirty-eight days in San Fernando de Atabapo. His written impressions were brief, despite his exultation at being in "Humboldt's country." He returned an invalid from San Fernando on August 13 and was carried across the trail in a hammock.

Recent scientific visitors to the portage have included Llewelyn Williams (1942) and a group of Venezuelan and German ecologists (1958). The New York Botanical Garden expeditions have visited the height-of-land on five different trips, most recently in June, 1959. Even twentieth-century visitors have continued to collect plants previously unknown to civilization, and all gain the impression of a benevolent rather than an inimical jungle. While it is now possible to ride across the trail in a sporadically functioning jeep, the park-like stroll is much more rewarding. All walkers echo the reflection of a Maroa doctor, long-time resident in Venezuela, that the Yavita-Pimichín portage is the most serene place he had known in the tropics.



A fossil bird, about three and a half inches long, with a prominent crest. It suggests affinity to a kinglet or titmouse. This is from the Oligocene Ruby paper shales.



A Country Housewife's Garden

By **Gertrude B. Foster**

Mrs. Foster is Editor of the
HERB GROWER MAGAZINE

THOSE OF US who are on the seed catalogue lists have learned to take the super-duper snaps and petunia pictures with a few grains of salt. Ever since the Shakers introduced the garden seed industry into this country about 1789, the gardener has been fair game for the grower's gorgeous paintings of annuals that seem larger than life-size in the bleak months of winter. With the advent of color photography, the buyer is better assured of something nearer veracity in the claims of seedsmen, and with so many variables in soil and care of plants, it isn't really their fault if your own plants do not measure up to the ones on the printed page.

In their interesting monograph SHAKER HERBS AND HERBALISTS, Edward Deming and Faith Andrews state that:

"In their herb and seed industry, the Shakers introduced certain merchandising practices later adopted by the "world." For the wholesale trade they put up seeds in cloth bags, but they retailed them in small "papers" or "envelopes" as is the present custom. In 1836 the New Lebanon Society also began to issue gardeners' manuals, priced at six cents, which gave useful instructions for the selection, preparation and management of a kitchen garden, with additional chapters on injurious insects, the preservation of vegetables in winter, the uses of vegetables, cooking recipes and pickling. Commenting on the right care of a vegetable plot, the compiler notes that "a garden is an index of the owner's mind." (The charming monograph, SHAKER HERBS AND HERBALISTS, was printed by Carl P. Rollins, New Haven, Connecticut, for the Andrews and the Berkshire Garden Center, Stockbridge, Massachusetts, on the occasion of a Shaker exhibit staged by Dr. and Mrs. Andrews at the Center in July, 1959.)

Having received the very attractive and clever catalogue of a mail-order nursery, famous for its flowers of one color, which is illustrated only with line drawings and pretends to no extravagance except in its prices, I had a chance to stop there last spring. If a garden is an index of the owner's mind, a nursery gives a clue to the buyers' madness, too, sometimes. The front of the nursery with many flowers in bloom looked as appealing as a show window. On drawing nearer I found that it actually was a huge super-market for plants. The buyer picked the potted plants out of frames and placed them in a little wagon to be taken to the check-out station. I never found out where that station was, because so many people were buying and the men serving them were so busy running back and forth, picking up the pots and putting them in the wagons despite the "self-service" signs.

Following the invitation of one large sign to "see our two acres of gardens," I wandered back on the hill away from the super-market bustle. There I looked for herbs, of course, and also for the gardens. What I saw was row on row of deep coldframes filled with grass and weeds with groups of trees or shrubs in rusted tin cans standing in them. Finally I located some plants with their roots in the ground, in the old-fashioned manner of a nursery, but they were also pretty well choked with weeds. Never finding the gardens, I returned to the road-side display and asked the price of *Artemisia schmidtiana nana,* the lovely 'Silver Mound' which makes an irresistible lure with its shimmering silver foliage. I was told that the price was on the plant. When I protested that I hadn't found it, I was curtly dismissed with "nothing comes down here unless it is marked." I thought to myself, "and unless it is in bloom." Finally the salesman sensed my impatience and walked over to the potted plants and turned the label around and read off the price. It was stamped, super-market style, on the back of the wooden label but not in sight for the customer, unless he took it out of the pot and turned it around. Then I looked at the backs of some more labels and seeing one marked ninety cents in a small pot of *Ajuga reptans,* I took myself off, sadder but wiser. Unlike the owners of the limousines parked out front, I decided that I liked the old informal relationship between the grower who loved his plants and the customers who bought them.

I have had enough experience in growing and selling herb plants to realize that it has been, up until now, a difficult thing to run a nursery and make money, too. The large growers usually stick to a few varieties and sell the plants wholesale at proper planting time. The small flower garden nurseryman spends a lot of time digging plants to order and walking about with the customer answering questions. As one old-timer told me, "The ladies always want to buy what is in full bloom and that is often not the best time to move it. Also they want to break it in two when they get home to share with a friend, which usually results in two dead plants instead of one live one." His was an up-hill row to hoe, educating as well as growing.

Middlemen in nursery plants are springing up all along the roadsides, like the pansy purveyors that used to set out baskets of the kitten-faced flowers by their store windows in the spring. To me they seem more sincere in their aims, because it is possible to set out pansies in full bloom and scarcely lose a leaf. But the nursery that offers "rare plants" super-market style and then carts the out-of-bloom and unsold plants back up the hill to its "gardens" to languish in rusted tin cans and stay stunted in paper pots until next season is something to make the sincere Shakers tremble again in their graves. The roadside stands where potted plants are sold do not pretend to be nurseries. When the plants are past their best, they are marked down for quick sale or given away. These roadside stands are not mailing out fancy catalogues offering the best of everything at all times. This seems to be the application of the advertising business to the art of flower growing. How long will it work with real gardeners? Perhaps only as long as people forsake quality for quantity.

Another trend in nursery practice is

(Continued on page 17)

Rodriguezia teuscheri thrives fastened to cork bark.

RODRIGUEZIA TEUSCHERI

By H. Teuscher

Mr. Teuscher, who is Curator of the Montreal Botanical Garden, has had two other orchids, in addition to the above, named in his honor—*Telipogon teuscheri* and *Epidendron teuscherianum.* A new orchid genus, *Teuscheria,* also bears his name; it has three species, and a plant, that reached Mr. Teuscher in July 1959, may prove to be a fourth.

Mr. Teuscher was dendrologist at The New York Botanical Garden for three years, leaving in May 1936 to become superintendent and chief horticulturist of the then new Montreal Botanical Garden, supervising the planning, construction, and preliminary planting. This institution has developed greatly in the passing years; the grounds and gardens are very beautiful. In the new conservatory complex, which now consists of nine large units, five have been fully planted, the others are being planted. And Mr. Teuscher is correct in saying, ". . . the conservatory will be quite sensational when all the plants have been set out and have at least a year or two in which to develop".

The following article is reprinted from the American Orchid Society Bulletin, June 1959.

PERHAPS, I should not myself write about this pretty little orchid which bears my name, but I was the one who first found it in the Ecuadorean jungle, and, in consequence, I know more about the history of its discovery than anybody else. The natural conditions under which it occurs and an account of the other plants which grow within little more than one hundred yards from it should be worthwhile to set down for posterity.

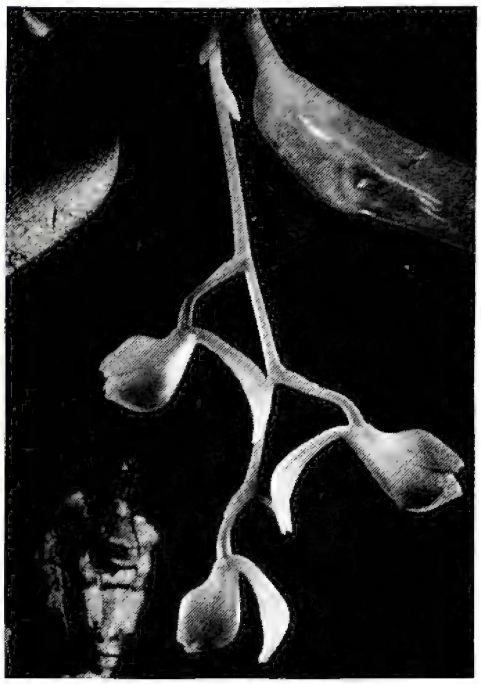
In the first place, I have to acknowledge that without the initiative of my friend, Señor José Strobel, in whose home near Cuenca my wife and daughter and myself stayed during our visit to Ecuador in the spring of 1956, I would undoubtedly never have seen the forest which I am describing below. Señor Strobel had visited this place previously and had found it so interesting that he wanted to show it to me. Secondly, if it had not been for the fact that at the time Señor Strobel was sitting high up in a tree, gathering plants of the beautiful *Oncidium falcipetalum* Lindley which was in flower but was determined later, he would quite surely have been the one to find this rodriguezia. He has the eyes of an eagle and can see orchids of particular interest from a distance which I am unable to do. I still remember how excited I was when, on wandering around on my own, I noticed the little plants on the bare branches of a tree. They were not in flower, but their habit of growth suggested to me right away that they must be a rodriguezia.

But, let us start at the beginning. The forest we visited is located near the road Cuenca-Guayaquil, and in spite of the fact that this road connects two of the three largest cities of Ecuador, it is very bad — not paved, of course—and in parts at least it is distinctly dangerous. It climbs over mountains to a height of over eleven thousand feet, goes steep down again to as low as eight thousand feet and climbs once more, winding endlessly in sharp, blind curves with an abyss on one side and a steep slope on the other. Guard rails on Ecuadorean roads are unknown, and when the bus travels only a few inches from the edge, as it frequently does because the roads are narrow, one looks a thousand feet or more down into a deep valley with a turbulent river at the bottom. To cheer up the travelers, the bus stops from time to time at newly erected wayside shrines, marking the place where a bus with thirty passengers has recently plunged over the edge, killing everybody in it. One has to develop a fatalistic attitude when traveling in Ecuador, but if one does, a trip over these roads certainly is memorable because the Andes are unbelievably beautiful. Fortunately, our bus had an exceptionally skillful and careful driver which made us feel perfectly safe. The bus stopped for lunch at the town of Ducur (seventy-five hundred feet), and thereafter the road commenced to wind down gradually to the coast.

Some twenty or thirty miles beyond Ducur, Señor Strobel asked the bus driver to stop at a road construction camp, located at an altitude of about thirty-four hundred feet. Unfortunately, this camp had been deserted since Señor Strobel had been there last, but its shacks were still standing and a caretaker had been left behind. The latter allowed us to sleep in one of the shacks—it was already getting dark by then—and his wife agreed to prepare meals for us. The shack assigned to us was in good condition but perfectly bare, and we had to sleep on the floor. Since the weather was warm—it must have been around 75° F. when we arrived—this did not seem so bad, but I had not counted on a temperature drop of at least 20° at night. The prevailing dampness—this was a distinctly wet region—made a temperature of 50° or 55° seem very chilly, and we had only one blanket each. Besides, my old bones complained mightily of the hard floor. I do not remember ever having

Left. The pretty flowers of *Rodriquezia teuscheri* are fragrant in the morning.

Below. Characteristic are the united lateral sepals, which are at first suspended free under the rest of the bud.



been so uncomfortable in my whole life, and I slept very little.

In the morning, despite a persistent drizzly rain, we went into the surrounding forest. These woods really looked the way one usually pictures a tropical jungle. The vegetation was extremely dense and fabulously rich. The trees were thickly covered with moss, and the ground was a tangle of fallen rotting tree trunks. I gathered three different species of *Selaginella,* but they are very difficult to bring home alive, and only one of them survived the hardships of travel. Several handsome gesneriads were present also. One, which has since flowered several times in our greenhouses, was determined by Mr. Raymond, a member of our staff, as *Trichantha minor.* It had been introduced into England over one hundred years ago but has long since disappeared from cultivation. My collection established its native origin which was not known at that time. A second gesneriad with smaragd-green leaves which are gold-powdered in the center —very handsome even as a foliage plant—has so far, unfortunately, refused to flower with us. The chances are considerable that it is new to science. A third one, which is half shrubby and grows upright with rather hard large leaves, shiny dark green above and bright red underneath, is now flowering with us with masses of tubular bright yellow flowers. It evidently is a new species of the genus *Alloplectus.* Among the orchids I picked up was a maxillaria which was not in flower. Later, when it flowered in our greenhouses, L. A. Garay, Curator of the Ames Orchid Herbarium at Harvard, recognized it as a new species which he named *Maxillaria tentaculata.* Its sepals have long tails and the whole flower is soft mauve in color, rather unusual for a maxillaria and distinctly pretty.

Besides the above-mentioned *Oncidium falcipetalum,* which is closely related to *O. lamelligerum* but has somewhat smaller, yellow and reddish spotted flowers, we also found a brassia. This was in flower, and I took it to be *B. longissima.* Later, however, Mr. Garay told me that it fitted perfectly Reichenbach's original description of *B. antherotes.* Having seen this description I am forced to agree, but I am still not convinced that it is possible to keep these two species separate. If it isn't, the name *B. longissima* has to be dropped and the older name *B. antherotes* has to take its place for this whole concept. There also was, as later determined, *Maxillaria microthrica* Schlechter and *M. attenuata* Ames & Schweinfurth, *Pleurothallis cardiostola* Rchb.f. and *P. monocardia* Rchb.f. as well as the odd *Cryptocentrum jamesoni* Benth., the plant of which looks like an amaryllid rather than an orchid. Neither of these last named five has ornamental merit.

Stanhopea insignis Frost which occurred rather frequently is more worthy of mention, and the rare *Stanhopea tricornis* Lindley, determined from a plant previously sent to me by Señor Strobel, which had also come from these woods but which we did not find this time, must not be omitted from the list.

Scelochilus pichinchae Schlechter, determined when it flowered in our greenhouses, is not very exciting; but its drooping panicles of bright yellow flowers, usually produced twice during the year, are quite pretty. Orchid fanciers, who are fond of small orchids and who have seen it here, have always exclaimed over it. It grow together with *Rodriguеza teuscheri,* and this latter I must now describe.

Rodriguezia teuscheri occurred only on the edge of the forest and always grew only on trees with smooth bark which did not permit the formation of moss. Together with the fact that this was a wet region with frequent rains, the clues for the proper treatment of this orchid in cultivation were plain to read. It thrives best when fastened to cork bark—suspended either horizontally or vertically—without or with only very thin osmunda padding, but with frequent wetting (several times a day) including occasional dipping in a mild fertilizer solution. A greenhouse night temperature of 60° F. is satisfactory, but during the day the temperature should rise to 75° F. Under this treatment this plant usually flowers twice a year.

The drooping raceme has only three to four flowers but these, besides being fragrant in the morning, are rather pretty. On opening, the sepals are greenish yellow outside and the lip also has a greenish sheen with brownish red markings. Within a day or two these colors intensify, the sepals develop a red flush and the lip becomes bright yellow in the center, its margins turning white with a purplish red flush. The rear of the lip is striated deep purple. Most striking and characteristic are the united (connate) lateral sepals which, as the photos show, are at first suspended free under the rest of the bud. When the buds are ready to open they reflex completely, and on the fully opened flower they give a very good imitation of a long curved spur. The other species of this genus which are in cultivation do not reflex

(Continued on page 18)

PUBLIC GARDENS OF MALTA

By **Bernerd C. Weber**

Mr. Weber is Professor of History, College of Arts and Sciences, University of Alabama, and was a Fulbright Research Scholar at the Royal Malta Library for the academic year 1956-57.

MALTA, the prehistoric "sacred island" of the Mediterranean Sea, the one-time dominion of the militant monastic order of the Knights of St. John of Jerusalem, and one of the well-known naval stations of the British Empire, is undoubtedly one of the most interesting spots in Europe. Of Malta's historic structures and archaeological points of interest much has been written, but comparatively little has been said of the beautiful gardens to be found on this small and relatively arid Mediterranean island. Yet these gardens possess both botanical and historical interest and deserve attention.

One of the oldest and most important gardens in Malta is the Boschetto, a veritable paradise of green, which lies below the rocky eminence of the fortress-like villa built in the late sixteenth century by Cardinal Hugues Loubeaux de Verdalle, one of the Grand Masters of the Order of St. John. The Boschetto is noted for its evergreen oaks and its terraces of orange and olive trees, loquats, and aromatic shrubs. On a warm evening the scent of the Aleppo pines and of the cypresses blending with the fragrance of rosemary, lavender, and wild thyme make the Boschetto one of the most attractive and delightful spots in the whole island.

The San Antonio gardens were established by Grand Master Antoine de Paule about the year 1625. These gardens contain some very fine orange and lemon trees and a considerable collection of ornamental trees and plants which from time to time have been imported from all parts of the world and acclimatized. Here one may see the leaves of a South American jacaranda mingled with those of a North American juniper. There is a stately group of Aleppo pines and cypress trees and a fine English oak of great age. All the avenues are flanked with beautiful flower beds, while near the avenues are glasshouses containing collections of tropical and sub-tropical plants. San Anton Palace, which is surrounded by these attractive gardens, now serves as the winter residence of His Excellency, the Governor of Malta.

Near the Hotel Phoenicia, luxury headquarters for the tourist trade, are the Maglio Gardens, located in Floriana, a suburb built between the inner and outer land defences of the capital city of Valletta. These gardens consist of two broad parallel walks separated by ornamental trees and flowers and further adorned by various bronze and marble busts of noted persons. The gardens take their name from the French ball game of palamaglio, especially popular in the seventeenth century and played by the Knights of St. John on this very spot. On warm days the walks are a popular promenade for nurses and a playground for children. On either side of the gardens lie two great pavements, the Parade Ground and the Granaries, where one may see curious jar-shaped pits sunk into the rock and sealed with circular stone slabs.

Across the road from the Maglio gardens are the Argotti Botanic Gardens, now under the jurisdiction of the Royal University of Malta. There is a very comprehensive collection of plants, including interesting local species, in these gardens. The cacti collection is particularly noteworthy. From this area also one may enjoy a panoramic view of much of the island. In the foreground looms the huge hospital of St. Luke, and on the skyline may be seen Verdalla palace and the towers of the medieval walled city of Mdina.

In Valletta, the capital city, there are three small but interesting gardens, all built upon the military bastions of this city. Near South Street are the relatively secluded Hastings Gardens, established in memory of the Marquis of Hastings, Governor of Malta from 1824 to 1826. Near the entrance to the Grand Harbor is the lower Barracca, once a place of recreation for the Knights of St. John. Graceful arcades ornament the harbor side, but the principal feature here is a fine monument in the style of a Doric temple decorated with allegorical statues. The monument, built by public subscription in 1810, honors Sir Alexander John Ball, the first British Civil Commissioner of Malta. The Upper Barracca, established during the 1660's, has an incomparable terrace which overlooks the Grand Harbor and provides one of the finest views in the whole island. Within the enclosure of the Upper Barracca are long arcades to the left and in front. Numerous memorials adorn this place. Of particular interest is a bronze bust of Sir Winston Churchill, presented to Sir Winston by the people of Malta and placed on this spot at his request. The white stone base is inscribed:

TO
THE RIGHT HONOURABLE
SIR WINSTON SPENCER CHURCHILL
K.G.
THE
PEOPLE OF MALTA AND GOZO
MCMLV

In the center of the Upper Barracca is a simple sarcophagus type of tomb in red-brown stone dedicated to the memory of Sir Thomas Maitland, Governor of Malta from 1813 to 1824. Because of his forceful and dynamic personality he is better remembered as "King Tom."

In addition to these public gardens there are, of course, many private ones, for the Maltese people are lovers of the beautiful. Because of their historic associations, the public gardens of Malta give one a glimpse into the past and some insight into how the present has come to be. They are indeed a fitting adornment for that Mediterranean island which has been the great link between East and West on the track of the everlasting voyages of mankind from the rising to the setting sun and from the setting sun to the morn.

HOUSEWIFE'S GARDEN (from page 14)

described very graphically in instructions to people who may want to make money in spare time by "collecting native trees, ferns and wildflowers" in THE HERB COLLECTOR'S MANUAL AND MARKETING GUIDE, published by J. Kelly, Looneyville, West Virginia. I quote with spelling unchanged:—

"There is big business in collecting native trees from the woods for resale to nurseries located throughout the land who will plant these and grow them on to larger trees that may be sold for landscaping, shade and ornamentals . . . These trees are wanted in sizes from 18 inches to 6 foot . . .When you get them into your storage place where it be inside or out, immediately grade and sort the trees into kinds and

sizes. The smaller sizes may be tied in bundles of 10 to 25 and placed in piles keeping the roots damp and covered with burlap. As soon as possible they must be healed either in the ground outside or in some material such as sand, sawdust or loose damp soil inside. . . . Larger trees should not be tied in bundles before placing in the healing in material as you cannot get the roots all covered good. After you once have them well healed in you won't have to bother them again all winter unless they are inside where the material may dry out and if so you will have to provide water to keep them damp. Inside storage should not be kept too warm as this will cause the trees to start growth which will ruin them for planting. Keep them in a cool place. If you keep them where it freezes it will not hurt them one bit. The only thing about this is that you cannot bother them while they are froze and if you should want to ship during a freeze you would have to wait till they thawed out. . . . Many are grossing over $3,000.00 yearly with this plan and you can do the same as the demand will continue to increase as the population increases."

Fortunate are we who live in the country where it is possible to pick out our plants from nursery rows or greenhouse benches. One small unadvertised but thoroughly sincere family greenhouse business near us is aptly called "The Happy Gardeners."

RODRIGUEZIA (from page 16)

their lateral sepals in this manner.

The trees of this forest also contained many handsome bromeliads. One, in particular, was very conspicuous, forming large, wide-open cups with the leaves being scarlet for two-thirds of their length, while the inside of the cup was bright yellow. This was determined by Dr. Lyman B. Smith as *Guzmania sanguinea.* Others which were determined after they flowered in our greenhouses were *G. angustata, G. strobilantha, G. gloriosa,* and *Tillandsia narthecioides.* Three other large species are still to be identified.

We should, of course, have stayed longer because we merely skimmed the edges of this wonderful jungle forest, but my daughter, who had accompanied me, and I were exhausted from our sleepless night and felt that we could not possibly face another one like it. Señor Strobel must have been terribly disgusted with us weaklings, but he did not show it and he did not protest when we said that we wanted to go home. So we left at noon, after only half a day's collecting, when a truck going to Cuenca picked us up on the road. Since I slept most of the way back, I remember little about the return trip. However, there was a sequence. I have just learned that on November 21, 1958, the very same bus on which we had felt so safe—it was No. 22 of the Nueve de Octubre Co. —suffered a terrible accident only two kilometers (about a mile and a quarter) from the road construction camp at which we disembarked. It turned over six times and rolled down the embankment. The driver was killed and all passengers severely, some fatally injured. This shows that one never knows when one is lucky.

SNOWSHOES FOR BOG TRAVEL

By Frank C. MacKeever

Mr. MacKeever is Custodian of the Herbarium of The New York Botanical Garden.

ANY OF the standard models of snowshoes make excellent means of traveling over bogs—especially quaking bogs.

However, before going into the matter, I should like to offer a few suggestions. When you travel over bogs—especially the quaking or floating types —it is *a must* that you carry a six- to nine-foot stout pole. I use a bamboo pole on which a rug has been rolled. Always carry it under an arm, or across your shoulders with your arms draped over it. Perchance you "drop through," it will then function as a plank does on thin ice and will help to keep you "up." I consider this as important as the spare tire in your car.

Another thing — should you ever (Heaven forbid!) "get stuck" in quagmire or quicksand, never fall forward! Fall backward! Throw out your arms! Grab for vegetation — or whatever there is of terra firma. By falling backwards, you have far greater control of the movement of your legs.

Do not get alarmed. Lie back and think things out. Remember this, if you can "float" in nice clear water when swimming, you can stay afloat in that "pea soup" with very little paddling of the hand—if any is necessary.

Bogs hold a great fascination for me —their construction—their flora—their fauna. Learn more about them — and your snowshoes will aid you in doing so.

I have used snowshoes any number of times in such terrain and have often wondered why someone else had not thought of giving them a try.

My favorites are a pair of the famous "pickerel" model, because they are long and narrow, and length seems to me to be more important than width in bog traveling.

Lacking snowshoes when I really needed them, I have fashioned a pair from two long saplings of stout wood, such as hickory or oak, and some three-quarter-inch chicken wire.

It might be wise for you to study the construction of a pair of snowshoes, when you get the chance, so you'll know how they are made. However, here's how I do it.

Bend an eight- to nine-foot sapling, about an inch in diameter, into the shape of a snowshoe and tie the two ends together with wire or strong cord. (Naturally — you make two.) Place this frame on a strip of three-quarter-inch chicken wire, forty-eight inches long by eighteen inches wide, or nearly these dimensions. Bend the chicken wire up and around the frame, using the cut ends of the wire for fasteners. Extra pieces of wire, or strong cord, may be used at intervals along the frame in order to fasten the chicken wire to the frames more securely.

When this has been done, weave a piece of sapling, about the same size of the sapling used for the frame, through the mesh of the chicken wire and across the upper edges of the frame *(some may prefer it under),* about sixteen or eighteen inches back from the front. Cut off the surplus tips and fasten the ends to the frame with wire or strong cord.

Now place the ball of your foot (shoes on) on this piece, and cut out a hole large enough to permit the toe of your shoe to move through it freely. Still better, make a small hole first, and then bend the wire back so as to form a smoother edge to the hole of the required size. Also, this will give more strength and rigidity.

(Continued on page 22)

No solid walls or enclosures obstruct the full view of the surrounding landscape from Sterling Forest International Research Building. The tiles with tulip motif were specially designed for the building.

The Story Behind A Major New Garden

By **W. Fred Johnson**

Mr. Johnson is the Director of Sterling Forest Gardens.

STERLING FOREST GARDENS, now being created on a one hundred and twenty-five acre tract near Tuxedo, New York, will open to the public May 1, 1960, with a display of one and a half million hyacinths, daffodils, tulips and other Dutch bulbs. Planning a single huge floral display such as this is a tremendous job in itself, but it is only a small part of the work being carried out, for the Gardens must be kept in continual bloom straight through the summer and into fall.

Our staff has traveled thousands of miles in this country, and Robert L. Dowling, President of City Investing Co., and other members of that organization, which is co-sponsoring the Gardens, have visited such famous foreign gardens as Tivoli in Rome, the Gardens of Versailles, Kew Gardens, Keukenhof in Holland, and even the famous gardens of Japan. All this was done to study methods of presenting constantly new floral displays and to observe at first hand the ways in which the interest and delight of visitors can be heightened in a garden.

FREQUENT NEW DISPLAYS

At Sterling Forest Gardens, we plan to introduce new floral themes every two weeks from May through the summer and far into the fall. Dutch bulbs —incidentally, the largest such collection in any garden in the United States —will give way to the finest and newest in iris and roses. Then annuals and perennials will come into bloom, to be followed in the autumn months by tremendous displays of chrysanthemums.

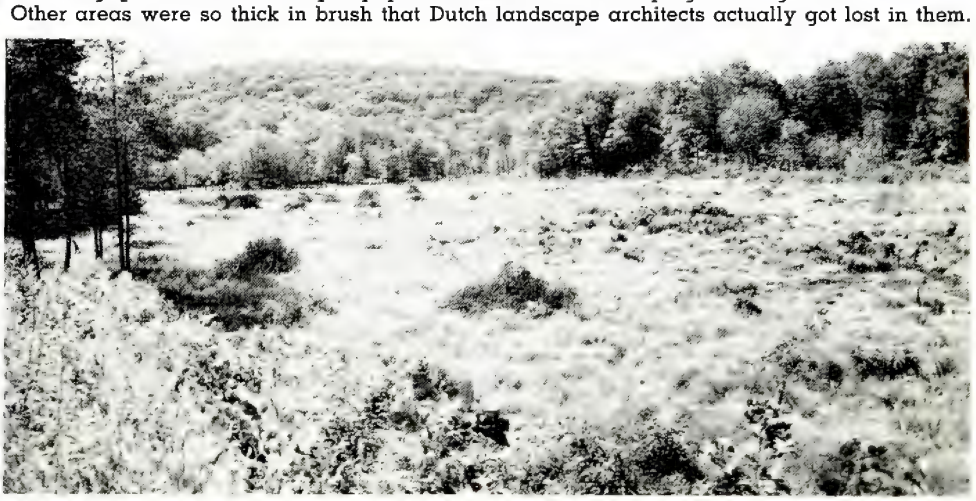
Sterling Forest Gardens are located in the foothills of the Ramapo Mountains, in a setting of woodland, meadow and rugged foothills. A number of small lakes have been created on the grounds, and unusual fountains, including a representation of the raintree, mythical tree of good luck and happiness, are planned to delight further the eyes of visitors.

EXOTIC BIRDS

The area being a wild one, there is already considerable bird life in the Gardens, and we believe that it will

Left. A survey team works in a woodland section of the extensive tract. Every stone and tree in Sterling Forest Gardens is shown on the huge topographical maps, that were used as planting and permanent guides.

Swampy sections had to be drained in summer 1958, so that they would be dry enough the following year for the heavy equipment needed in developing Sterling Forest Gardens. Other areas were so thick in brush that Dutch landscape architects actually got lost in them.



Above. Drainage was one of the major problems in creating Sterling Forest Gardens, for without a complex and highly efficient drainage system a heavy downpour could do extensive damage.

Below. A section of Sterling Forest Gardens begins to take shape, in preparation for some of the huge plantings. Trees and native flora were carefully preserved.

Nature — Friend and Foe

Many times the elements of nature that have worked against us were the very ones we wanted to harness and have work for us. The principal ones, of course, were weather and water — water in the form of rains, floods, torrential downpours, masses of water falling and flowing across a very narrow area confined between hills.

The main part of the Gardens is located in what was a swamp two years ago, with several feet of water standing in it. It was surrounded by wooded hills, which created a basin through which floods poured. Deposits of peat and clay in the swamp had been covered by water for centuries, perhaps thousands of years, and our first task was to cut huge drainage ditches fifteen feet deep through the area to permit this water to drain out.

A Solution Found

After much study and experimentation, we learned that it would be impossible to drain the underground water regardless of how many ditches we might dig, for it was trapped by various layers of clay and peat in a very complex arrangement. The only solu-

increase markedly as time goes on. But many of our native birds are rather inconspicuous; so to bring additional color and brilliance to the Gardens, exotic species will be introduced. We should like also to have a few of the deer native to Sterling Forest in the Gardens, but we have learned that they unfortunately have a very healthy appetite for the leaves of our hundreds of thousands of tulips! They will be fenced out, but can be seen roaming the other parts of the Forest.

No doubt everyone is going to exclaim over the scope of the Gardens and their wealth of plant material, but probably only one in a thousand visitors will realize that the story of their development has been, and continues to be, one of constant struggle against time and nature. We have been working for nearly two years to transform the area into this major floral showplace, and we have had as many as one hundred and fifty men and dozens of large and small pieces of equipment busy at the job through the spring, summer and fall of both 1958 and 1959.

A number of small man-made lakes will be a feature of Sterling Forest Gardens. Here is one of the lakes in its early development.

land). It will open when the flood level in the lakes reaches a certain level, so that heavy floods can be passed through the system and out of the Gardens without causing damage to them.

We had to think not only of how to get rid of the water but also how to get it back during the dry seasons, when plants need water badly and when the lakes might become dry. An irrigation system of pipes was installed. To make sure that the lakes do not go dry, we had to go to another swamp on a higher plateau above the Gardens, and this was converted into a ten-million-gallon reservoir and emergency water supply.

An Invasion

Another major problem in the development of Sterling Forest Gardens was the dense growth of brush in the swamp area. In fact, it was so dense

tion was to strip off the entire area and remake it completely with the clay as a base, then a deep layer of pervious sand and finally a layer of soil for growing the plants. By this method we were able to establish the underground water table at a desired level and to control it.

We had to prepare for flash floods of three- to five-inch rainfall within an eight-hour period. Such a devastating flood pouring down from the surrounding hills into the flat basin which would be the Gardens could destroy them.

"Dutch" Dam

Our solution was the creation of the series of lakes in the Gardens which are actually flood catchment basins, and which at the same time serve the aesthetic purpose of further beautifying the grounds. These catch basins are linked by underground conduits, permitting the flood of water to flow from one to another. Finally, the entire system is regulated by an automatic dam (called "Dutch" dam because the design is a copy of one we saw in Hol-

An unexpected dividend at Sterling Forest Gardens was the peat found in the swampy areas of the great flower meadow. Some of the peat is used to provide ideal growing conditions for the plants to come.

that two years ago Dutch landscape architects responsible for the overall garden design got completely lost in it for about thirty minutes when they were making an inspection tour. Finally we heard their yelling and directed them back to the highway.

Seventy-five men, thirty-five chain saws and several bulldozers worked for three months during the summer of 1958 clearing out the area. During the height of this operation the noise in the confines of this basin was intense—in fact, it sounded like an invasion!

Even while this clearing was going on, six crews were working continuously surveying the area, and two draftsmen were translating their information on to detailed topographical maps. These are unusually large in scale and unusually detailed — we know the location of every single tree and every single boulder in Sterling Forest Gardens, and also the depth of the soil everywhere within its bounds.

Joop Ruyter, one of the nine Dutch experts who supervised the planting of a million and a half Dutch bulbs at Sterling Forest Gardens, astonished American workmen by appearing in wooden shoes. He insists that they are the most practical and comfortable foot-gear for gardening work.

W. Fred Johnson (in white shirt, black tie), Director of Sterling Forest Gardens, oversees construction work. As many as one hundred and fifty men worked this past summer to get the Gardens into condition for their opening on May 1, 1960.

Rainy Day Blues

Great pains were taken to preserve every possible tree in the area, and also the shrubbery, such as the native laurel. With huge bulldozers and drag lines working all through the area, this was no simple task. Special equipment had to be selected and extreme supervision exercised for working the ground among the trees to prevent scarring them and damaging their root systems.

Spring of 1959 came, and even though we had studied weather reports for many years past, we began watching the skies as anxiously as a wheat farmer in the Middle West at spring planting time. We knew that when rains came our equipment would bog down and work would have to be stopped. Initially a heavy rain would stop work for ten days to two weeks. After the area was shaped and improved, this loss of time was reduced to two or three days. In our schedule of work we had allowed fifty percent lost time due to rains from June, 1958 to May 1, 1960, the opening date. We have needed every day of good weather.

Supreme Test

Our flood control system came to a supreme test at the last rain on Friday, Saturday and Sunday, October 22, 23, and 24, 1959, when a record rainfall of 3.5 inches descended within eight hours. Our hearts were in our mouths, as we watched to see if our system would work or if the Gardens would be destroyed. The system worked. The Gardens were not destroyed. Rather, within hours after the rainfall we were able to walk almost any place; within twenty-four hours we could walk in the flower beds and within forty-eight hours planting was resumed.

The Dutch have been cooperating throughout this mammoth project by the International Flower Show Committee of the Netherlands. When planting time came this fall, for the one million and a half tulips, hyacinths, daffodils, and other bulbs, they offered to see us through that immense operation by sending nine young experts to supervise our untrained men. We owe the Dutch lads a vote of gratitude for all their interest and for their drive in getting the work done.

We hope that this brief report gives horticulturists, gardening enthusiasts, and the general public some idea of the tremendous amount of planning and work that has gone into the creation of this new, major floral showplace. Creating the lovely spectacles which they will see beginning May 1, 1960, has been a major undertaking, with its full share of anxious and worrisome moments, hours and days. At the same time it has been an inspiring and exhilarating experience which more than two hundred men and women have shared. We hope, in turn, that the Gardens will prove an inspiring and exhilarating experience to the millions of people expected to visit them over the years.

FOR BOG TRAVEL **(from page 18)**

After you have made and used a dozen or more models, your own creative imagination and skill will come into play, and the final results of future models will be astonishing.

Fasten your famous and fancy snow sandals to your shoes by using regular snowshoe bindings or a strong rawhide thong. If you are a Scotsman (as I am), a strong piece of clothesline may be employed.

Once you have your "sample shoes" *(used by all shoe stores)* fastened to your feet, and you stand there wondering how to get underway—Well! Forget They Are There! "Do just what comes naturally." Walk naturally!

A DAY OF RECKONING

Our Shade Trees can be Attractive Assets or Costly "Green Elephants"

***By* Jake Gerling**

Mr. Gerling, Superintendent of Maintenance, Parks and Playgrounds, Rochester, New York, has long advocated the use of better-adapted species and forms for more practical service on city streets and more gratifying use on home grounds. During the past twenty years, his illustrated lectures before interested groups in state universities and leading cities, and his informative articles, published in widely circulated magazines, have done much to bring about the present-day renaissance in arboriculture.

A DAY OF RECKONING IS HERE, proclaimed far and wide by the incessant whine of power-saws, as we labor at the Herculean task of eliminating huge, age-debilitated, disease-stricken trees from our city streets and dooryards.

To many people, the problems posed by king-size street trees, whether they are ravaged by disease or have outlived their usefulness and become costly liabilities, are merely 'headaches' for local authorities; but consideration of the following facts should alert taxpayers, everywhere, to their stake in these multi-million-dollar headaches which are taking such alarmingly disproportionate bites out of public-service budgets in so many localities. When phloem necrosis was rampant in Columbus, Ohio, more than twenty thousand American elms were killed, and the more than one hundred thousand remaining elms will very likely fall victims to the Dutch elm disease. Many cities have American elms and are now frantically trying to control this ruthless scourge which seemingly defies determined efforts to stay its devastating march. Canker-stain fungus blight became epidemic in Philadelphia a few years ago, and ten thousand plane trees were killed in a single year.

Every mature elm tree within the ever-increasing area of infestation, when finally felled by the Dutch elm disease, will have cost taxpayers at least one hundred dollars, the minimum unit expense, at present costs, for spray programs, sanitary control measures, and eventual removal; at this rate, a city having two hundred thousand elms within its corporate limits, and there are many such, may well have to spend twenty million dollars over the next few years. To this tidy little sum, we must add the cost of repairing curbing and sidewalks disrupted by heavy buttress roots, and enormous expenditures made by utility companies for constant line clearance work and repairs to power lines damaged by wind-shorn branches and storm-felled trees; these last items are a considerable part of the monthly service bill. For "insult added to injury", consider the plight of hapless home owners who have outsize trees on their property; if and when removal of such trees is ruled essential to an effective, all-out blight-control program, or deemed a public safety hazard by local authorities, the owners can be ordered to have them destroyed, at their own expense, "or else" (the "or else" being the city's prerogative of doing the work and tacking the cost on the owner's tax bill). Recent legislation in some states makes this procedure a very real possibility. A citizen, confronted with this unwarranted expense, may unexpectedly get a very cost-

Every tree on this street has broken the sidewalk or damaged the driveway.

There is no interference with the lighting system, when a street is replanted with the columnar form of *Acer saccharum*.

Magnolia soulangeana makes an attractive parkway planting.

ly what-not-to-do lesson in the proper selection of shade trees best suited for satisfactory service on the home grounds, but certainly will not "make the welkin ring" with paeans of gratitude to the planter whose poorly advised choice has burdened him with these ill-fated "green elephants".

Indeed, a day of reckoning is here, and general renaissance in city street embellishment is obviously needed. However, lest we be unduly harsh in our appraisal of 'inherited' plantings which have proved so unsuitable under present-day conditions, in fairness to those responsible we must give due consideration to those pertinent factors that, in their era, influenced their choice: elms, soft maples, poplars, and planes were easily grown, handled well, and were quite tolerant to the much less than ideal conditions afforded by street-tree-belt locations. Their large heads of foliage possessed properties held essential for required service: they acted as filters and arresters of dust raised by traffic on unpaved streets and sidewalk paths; transpiration of moisture had cooling effect during warm weather; shade cast by their immense canopies reduced the temperature in homes; and some forms made effective windbreaks. These reasons were perfectly valid, at the time, but are certainly worthy of little consideration now as determining factors in the selection of species and forms best suited for satisfactory service on streets or home sites in our modern cities. There is little excuse for continuation of practices proven inadequate; pavements, insulated and air-conditioned homes, and the negligible number of pedestrians on streets in residential areas have virtually eliminated need for the beneficial properties of towering trees which, desirable as they were in past generations, are far too costly luxuries for our times. Unfortunately, with inexcusable disregard for the high maintenance costs inevitable in street planting of poorly chosen, large-maturing, misplaced species, all too many 'weed trees' are still being planted by uninformed, or just plain irresponsible, city foresters.

Much of our present and immediate future distress could have been avoided, if "a voice crying in the wilderness" of king-size street trees, almost a half-century ago, had been heeded. This voice was that of Bernard H. Slavin, retired superintendent of parks in Rochester, the man whose keen foresight, inherent ability and earnest devotion to his work characterized more than fifty years of outstanding service in the development of Rochester's nationally known parks. As early as 1915, Bernard Slavin realized that overgrown trees, far too closely spaced, were becoming an expensive nuisance on city streets; and thousands of gaunt skeletons marking the ruthless spread of Chinese chestnut blight, then well on its way toward total destruction of this valuable species, alerted him to the fallacy of using any one species too freely in city-street plantings. Furthermore, the constant conflict of large trees and power lines was increasing, as utility installations kept pace with the rapid advance toward modern living, and the advantages to be gained by use of smaller-maturing species and their more compact variants became obvious. While dissatisfaction was voiced on every hand,

(Continued on page 29)

Costly storm damage from wind-felled, large street trees.

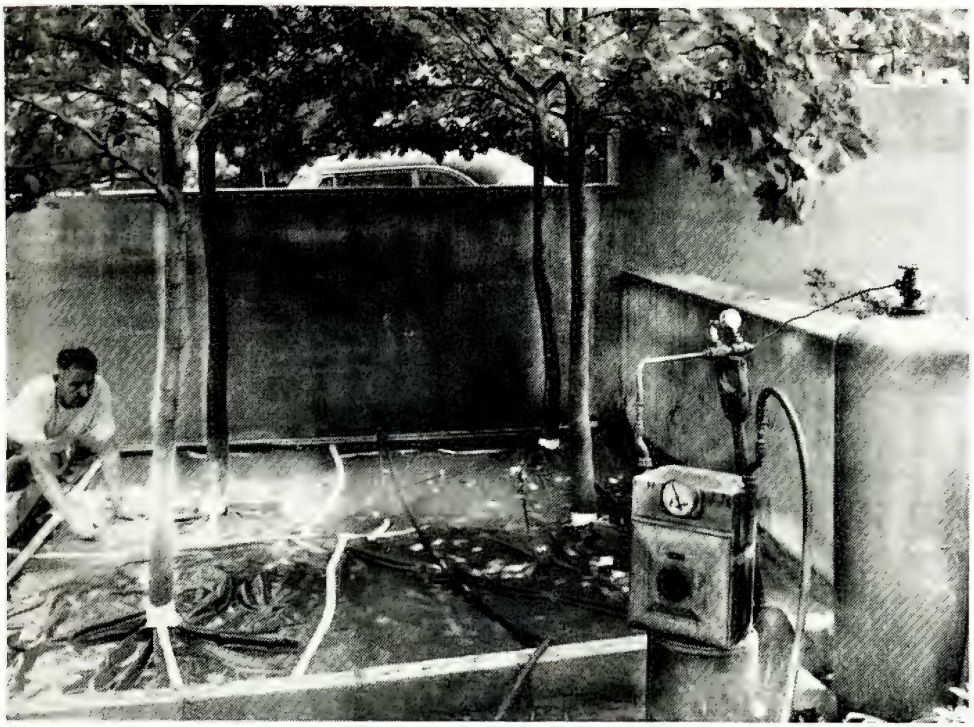


Fig. 1. Natural gas is being introduced into the soil around four- to five-inch DBH London planes. The gas is confined by walls and a plastic sheeting.

THE RESPONSE OF SHADE TREES TO NATURAL GAS

By **P. P. Pirone**

Dr. Pirone, Plant Pathologist of The New York Botanical Garden, presented this paper before the American Gas Association Claims Committee, Boston, Massachusetts, September 1959.

THE widespread conversion to natural gas in recent years has raised the question as to how toxic this substance really is to trees and other vegetation. Many papers have been published on the toxic effect of manufactured illuminating gas on plant life, but very little reliable information is available on the effect of the natural product.

In May 1956, the manager of the insurance and claims department of a well-known gas company in the New York area asked me about the toxicity of natural gas to trees. His company was being billed for large numbers of dead or dying trees, many of which were near leaking natural gas mains, but he felt that factors other than gas were responsible in many instances.

I advised this man that very little information was available on the subject, but that it was my opinion, based on the available information, that natural gas was relatively nontoxic as compared with manufactured gas. I told him I would be able to express a more definite opinion if I could conduct some specific tests with the natural gas. A modest grant to The New York Botanical Garden was soon received from the interested company to initiate these tests.

Before undertaking the research, I interviewed Dr. P. M. Zimmerman (who has since died) and Dr. A. E. Hitchcock at the Boyce Thompson Institute, Yonkers, New York, two of America's best-known experts on the effect of gases on vegetation. Both assured me that their earlier work indicated natural gas was nontoxic to vegetation. As a further assurance, I felt it would be wise to conduct a series of well-planned experiments anyway.

Greenhouse Tests

Our[1] first tests were started on July 9, 1956, in the plant pathology greenhouse at The New York Botanical Garden. The gas used was supplied in tanks by the cooperating gas company and was taken directly from high-pressure mains as it arrived from Texas. It had the following components in percentages: methane 94.5; ethane 3.6; propane 0.8; higher hydrocarbons 0.4; carbon dioxide 0.7; nitrogen 0.0. The specific gravity was 0.60 and the B.t.u. 1040.

The gas was introduced for varying periods directly to the roots of experimental plants growing in pots. The lower stem and the pots were enclosed in a moderately air-tight, ten-gallon, galvanized can capable of holding two plants at a time.

Because tomato plants had long been known to be extremely susceptible to certain components of manufactured illuminating gas, these were the first plants tested. Two-foot tall, vigorous 'Rutgers' tomatoes were exposed to the natural gas for periods ranging from four and a half to forty-eight hours. After exposure the plants were removed from the gas chamber and placed in the greenhouse, where they were grown for at least four weeks.

No abnormal symptoms developed in either the tops or the roots. All the plants remained healthy throughout the

Fig. 2. John Walther, the author's assistant, examines the foliage of Norway maple seedlings. The leaves look perfectly normal. The roots were exposed to a continuous flow of gas for nearly three weeks.

1. Miss Biruta Eimanis and John Walther ably assisted in carrying out these experiments.

Fig. 3. The roots and lower stems of the four Norway maple trees on the left were exposed to natural gas for six weeks in late summer and early fall 1956. Here, in May 1957, the leaves are as healthy as on the two ungassed control trees on the right.

course of the experiments.

The second series of pot tests were made on two-year pin oak seedlings. The roots of these trees were exposed to natural gas for periods ranging from four to forty-eight hours. The young trees were then removed from the gas chamber and placed in the greenhouse bench adjacent to ungassed pin oaks of the same age.

Two weeks after exposure, the treated trees actually looked greener than the ungassed trees. Apparently the introduction of natural gas into the soil around the young trees' roots caused growth stimulation similar to that resulting from the addition of a plant food. A similar effect was noted by Deuber[2] when trees were subjected to small quantities of manufactured illuminating gas.

Tests with Larger Trees

A third series of tests with the natural gas was made on four relatively large trees growing in one corner of our experimental garden. The trees were London planes *(Platanus acerifolia)* four to five inches in diameter at breast height. Cement walls bordered two sides of the garden corner. To confine the gas as closely as possible within the root area, walls of concrete-cinder blocks were built to a depth three feet below the surface on the other two sides. A special plastic sheeting, known as "Larvacover," was placed over the soil surface to further confine the gas in the soil.

The gas was introduced on August 1, 1956, by means of a tree-feeding needle inserted to a depth of two and a half feet at a point equally distant from the four trees. (Fig. 1) About two hundred cubic feet of gas were introduced into the root zone over a period of several days. The plastic cover was kept over the soil for nearly three weeks after the gassing.

The four gassed trees, as well as three others of the same age well beyond the treated area, were observed for the remainder of the growing season. Both lots continued to look normal. They also looked normal the following growing season.

Experiments with Moisture-Free Gas

The most extensive series of tests in 1956 were made with Norway maple seedlings, from September 5 to November 14. The trees were three to four years old and were growing in pots ranging from five to eight inches in diameter. The lower stem and the pots were enclosed in the ten-gallon can as in the early tests. (Fig. 2).

Fig. 4. Above. Close-up of specially made gassing chamber with London plane, Norway maple, and pin-oak trees before being gassed. A gas pipe leads into the drainage hole beneath each pot. Some of the control trees are next to the gassing chamber.

Fig. 5. Right. One of the author's sons is placing half of the lid on the gassing chamber.

The natural gas used in these tests was supplied in tanks by the Matheson Company of East Rutherford, New Jersey. It had virtually the same analysis as that used in the early tests: methane 93.5 per cent; ethane 3.5 per cent; propane 1.0 per cent; higher hydrocarbons 0.5 per cent; carbon dioxide 1.0 per cent; and nitrogen 0.5 per cent. The specific gravity was the same, 0.60, and the B.t.u. 1036.

To remove moisture, the gas was first passed through a drying tower containing anhydrous calcium sulfate, sold under the trade name "Drierite." This was done to determine whether moisture-free gas would dry out the soil around the roots and thus cause damage.

The gas was introduced into the root zones of six duplicate sets of trees for periods ranging from two to thirty-six days and in amounts varying from twenty-four cubic feet for the shortest exposures to eight hundred cubic feet for the longest exposures. Control trees of the same size and age were grown under identical conditions near the treated trees.

The soil around the trees subjected to the longer gas exposures was watered once a week by removing the seal between the trunk and the lid of the gassing chamber and adding water at that point before resealing the opening.

After being exposed to the gas, the trees were removed to the greenhouse for further observation. Control trees

2. Deuber, C. G. Stimulative Effects of Gas on Small Trees. Am. Gas Assoc. Monthly 15: 380-383. 1933.

Fig. 6. Dr. Pirone examines the foliage of Norway maples treated in 1958 with a mixture of natural gas and mercaptan. The leaves appear to be as normal as those of the ungassed control trees on the right.

were handled in the same way. All trees held their leaves until late December, and except for an infestation of spider mites on both gas-treated and control trees, they appeared normal.

The trees were then moved into coldframes for the winter. They were observed carefully during the following spring and summer. Both gassed and ungassed trees produced normal leaves during the 1957 and 1958 growing seasons. (Fig. 3).

Rye grass seed was planted in soil containing trees that had been gassed for eleven days. This was done as soon as the trees were removed from the gassing chamber. The seed sprouted within two days and grew as normally as that sown in ungassed soil. This indicated that natural gas, unlike manufactured gas, left no toxic residues in the soil.

Studies on Effects of Long Exposure

In the fall of 1956 I decided that more extensive tests over longer periods of exposure would be highly desirable. With the help of two technical staff members of the cooperating gas company, a larger air-tight gassing chamber was designed and built. It was constructed of heavy sheet steel and was approximately six feet long, two feet wide, and two feet high. Seven pipes in a false bottom were so arranged as to enter the drainage hole of each of seven, seven-inch pots containing the growing trees (Figs. 4 & 5). The lid of the chamber was made of two telescoping parts with large enough holes to take care of the tree trunks and with special watering holes that could be sealed during the gassing period.

On January 1, 1957, seven dormant trees averaging five feet in height (three Norway maples, two London planes, and two pin oaks) were placed in the gassing chamber located at the rear of my home in New York City. They were set in such a way that the pots in which they were growing were completely sealed inside the chamber, only the trunks and branches extending into the atmosphere. A special compound, "Duxseal," was used around the base of each trunk contiguous to the lid of the gassing chamber. The gas line was connected directly to my house service so that a constant supply of gas was available. The gas was turned on late in the afternoon of January 1 and the flow into the chamber so regulated that the escaping air at the other end of the gas chamber could be heard. A long rubber hose was placed at the exit so that the surplus gas could escape into the atmosphere about eight feet from the gas chamber.

The gas was allowed to run over the dormant roots until February 16, 1957, just two days short of seven weeks. The trees were watered three times during this period.

The concentration of gas inside the box was measured at periodic intervals with a Davis Gas Tester by inserting a tube into the chamber through one of the watering holes, and by sampling the gas at the exit tube which released the surplus gas into the atmosphere. After the first full day of exposure, the Davis Gas Tester showed one hundred percent gas inside the chamber and at the exit tube.

The seven gassed trees, as well as three control trees (one of each species) which had been kept nearby with no gas treatment, were brought to my greenhouse on February 16, placed on benches, and watered.

All gassed trees and the controls developed normal leaves. This indicated

Table 1

Substances Comprising Natural and Manufactured Gas

Substance	*Natural* %	*Manufactured* %
Unsaturated hydrocarbons— ethylene, acetylene, benzene, butylene, propylene	None	8.0
Carbon monoxide	None	33.0
Cyanogen compounds and hydrocyanic acid	None	5.0
Hydrogen	.0	33.0
Carbon dioxide	1.0	1.5
Oxygen	0.4	1.0
Nitrogen	0.6	6.0
Saturated hydrocarbons— methane, ethane, propane, etc.	98.0	12.5

that dormant shade trees subjected to natural gas for nearly seven weeks were not harmed.

A second series using four-year-old dormant Norway maples, pin oaks, and London planes was set up on February 28, 1957. The gas was turned on March 1 and allowed to run continuously until April 14. Control trees of the same species were placed near the gas chamber but were not subjected to gas.

As with the earlier trees, this lot developed normally when brought to the greenhouse in mid-April.

On May 1, 1957, another series using trees in full leaf was started. The trees were placed in the gas chamber and their roots bathed constantly for six weeks with natural gas. Control trees in full leaf and of the same age were kept in pots nearby. Water was applied as needed. During that period one of the seven trees in the gas chamber died, as did two of the ungassed control trees. These were assumed to have died from transplanting shock, inasmuch as their roots had been drastically cut to fit the trees into the pots.

Still another series was started using three Norway maples, two pin oaks, and two London planes on June 16, 1957. These were subjected to constant gas for five weeks, during which the gas concentration in the chamber varied from sixty to one hundred percent, as shown by the Davis Gas Tester. All these trees, and the ungassed controls, continued to grow normally for the remainder of 1957 and 1958.

Tests with Manufactured Gas

During 1957 and running concurrently with the natural gas tests, we subjected dormant Norway maple trees as well as trees in full leaf to a simulated manufactured gas prepared by the Matheson Company. The gas had the following percentage composition: methane 75.0; ethylene 11.0; hydrogen 6.0; nitrogen 6.0; and carbon dioxide 2.0. These tests were conducted in the smaller gas chamber used in the first tests.

Most of the dormant trees exposed to this mixture for six weeks failed to leaf out and soon died. Control trees of the same age grew normally. Norway maple trees in full leaf, subjected to this mixture, wilted and died in one week to ten days. Control Norway maples in full leaf continued to grow normally.

Effect of Mercaptan — Natural Gas Mixture

A final series of tests was run to determine whether the odorant mercaptan, commonly added to natural gas, might be toxic to trees.

In September, 1958, the roots of young (two- to six-year old) potted Norway maples, London planes, and pin oaks were subjected to a constant flow of natural gas in the large chamber for four weeks. Included in this gas was mercaptan in concentrations as high as forty times the amount normally introduced into natural gas used by consumers.

Chemists from the cooperating gas company helped by designing special apparatus for releasing the odorant into the natural gas, and by periodically checking on the amounts introduced.

During the course of these tests, the air was sampled from time to time at the exit hole of the gas chamber with a Davis Gas Tester. This machine showed that, after the first day's run, the gas content in the chamber ranged from eighty to one hundred percent.

The trees subjected to a combination of natural gas and mercaptan showed no ill effects. (Fig. 6). They looked as good as or better than control trees of the same age not exposed to any of these materials.

As soon as the trees were removed from the gassing chamber, the soil in which they had been growing was sown

Fig. 7. This healthy Norway maple was photographed on Staten Island in early August 1959, two years after an eight-year-old natural gas leak near it had been repaired. (Reproduced from colored negative.)

with rye grass. The soil around untreated trees also was sown with the same kind of seed. The rye grass developed normally in both lots. These results indicated that no toxic residues remained in the soil that was constantly bathed for four weeks in a mixture of natural gas and mercaptan.

All of our tests conducted from July, 1956, through September, 1958, indicated definitely that natural gas is not toxic to shade trees, tomatoes, or rye grass. One need only compare a typical analysis of natural gas with one of manufactured gas to see why this is so (Table 1).[3]

This table shows that natural gas does not contain any unsaturated hydrocarbons, hydrogen cyanide, or carbon monoxide, which are present in manufactured gas and all of which are known to be toxic to vegetation.

One might argue that the experimental trees used in the major part of the present work were not exposed for a long enough time. I felt that exposing the roots of young trees in leaf to a steady flow of natural gas for six weeks was a sufficiently long period, inasmuch as the same kinds of trees are permanently injured by manufactured gas within a week to ten days.

Moreover, there is photographic evidence of a Norway maple tree and a privet hedge whose roots were bathed with natural gas for nearly eight years and were still perfectly normal. This situation was discovered quite by accident. The tree, which was growing near a privet hedge, had been selected as a subject for gas exposure. It was about five inches in diameter at breast height, fifteen feet tall, and about fifteen years old. A special gas line was inserted into the soil to allow gas to bathe the root area of the tree. The gas was turned on June 3, 1957, and allowed to run constantly for six weeks. At the start, the rate of flow was about two cubic feet an hour. This was increased to ten cubic feet within a week and to fifteen cubic feet nine days later.

Bar-hole readings were taken daily throughout the six-week period from eight different areas. After the first week, all holes indicated presence of gas, ranging from thirty-two to ninety-six percent. The Norway maple continued to grow normally, despite six weeks of constant gas flow over its roots.

After the gas was turned off in mid-July of 1957, bar-hole tests continued to indicate high concentrations of gas in the soil. It was soon found that a gas leak existed in one of the mains near the test plot. When the main was uncovered, it was apparent that a poor welding job about eight years earlier was responsible. There was no doubt that gas had been leaking around the tree and the privet hedge all that time.

The Norway maple and the privet hedge were still in excellent health when photographed (Fig. 7) in August, 1959, two years after the eight-year leak had been repaired.

During the period of this investigation, I had an opportunity to examine more than three hundred large dead or dying shade trees alleged to have been killed by escaping natural gas. My investigation revealed that other agents, particularly fungi, were responsible for the death of the trees.

3. Adapted from "Tree Maintenance" by P. P. Pirone. Oxford University Press, New York, 1959.

DAY OF RECKONING (from page 24)

very little was done to rectify conditions and, to the best of this writer's knowledge, Bernard Slavin was the first city arborist actually to do something about the worsening situation. His noteworthy accomplishment in the selection and use of well-suited street trees is evident today on many Rochester streets, where maintenance costs, power line conflicts, and lighting interference have been reduced to a minimum; in these plantings small trees, fastigiate and columnar forms, have proved their worth in coping with the limiting factors present on so many city streets, and maintenance costs are but a fraction of that required by outsize trees. Outstanding among the improved forms, used so successfully in Slavin's early test plantings, are *Acer platanoides erectum, Tilia americana fastigiata,* and *Ulmus americana ascendens* (his own introductions), and the columnar sugar maple. For smaller species types he selected *Sorbus alnifolia, Tilia cordata, Ostrya virginiana,* and flowering trees of the genera *Magnolia, Malus,* and *Halesia.*

About twenty years ago, when Slavin's excellent street plantings were called to his attention, E. H. Scanlon, who for many years had been preaching "the proper tree for the proper place" and decrying current street-planting practices, was one of the first arborists to appreciate fully the practical advantages so well demonstrated in Slavin's work. While city forester in Cleveland, Ohio, Scanlon embraced the opportunity to do some outstanding work with better trees, but was limited and handicapped by the fact that most of the desirable species and forms, suited for use in well-designed street-tree programs, were not available in the trade. A man who does more than talk about unsatisfactory conditions, Scanlon soon started his "Tailored Tree Nursery". Now many smaller, better adapted trees are available for general use by city foresters and private planters.

It is most gratifying to Slavin, Scanlon, Wyman, Pirone, Lewis, the writer, and others who have spent time and effort forwarding the good work, to note the rapidly increasing trend toward use of more suitable trees and the number of nurserymen growing them. This has been a long, difficult and often discouraging task, but these well-known authorities are responsible for today's renaissance in city-street planting. They have enabled city planners to formulate and administer practical, comprehensive street-tree programs, consistent with the development of modern residential areas, and have also made possible a wider choice of trees, both functional and ornamental, for more satisfactory service on the home grounds.

FRENCH PLANT BREEDERS (from page 3)

breeding plants good, bright, and easy to grow, we shall encourage and facilitate the making of gardens, big and small, and maybe we alone are to have the means of bringing men, or at least a certain number of them, to the realization that mechanical civilization is not enough to satisfy the desire of the soul. We may help man to keep or to find again the contact with nature that is akin to his own nature. We have to be conscious of the fact that our mission is noble and important, and that is how we shall be able to maintain the great traditions that we have inherited from horticulturists all over the world.

BOOK REVIEWS

FLOWERING CRABAPPLES. Arie den Boer. 226 pages, illustrated, indexed. American Association of Nurserymen, Washington, D. C. 1959. $4.95.

Admirers of Arie den Boer and his work with crabapples are happy that his book, undertaken as a labor of love over a period of many years, has finally been published.

Mr. den Boer writes about his favorite trees in a way to make any gardener want to grow them. He describes their great variety of form, foliage, flower and fruit, and gives advice on their planting and care. The descriptions are supplemented with line drawings of leaves, flowers and fruits. The information is presented simply enough for the beginner, and completely and scientifically for the advanced gardener.

Many cultivar names have been revised to conform to the new nomenclature code. This reviewer regrets the resulting mixture of Latin and English in such monstrous names as Aldenhamensis Crab, Charlottae Crab, Eleyi Crab, Hoopesii Crab and Nieuwlandiana Crab. If this practice is widely followed, it will nullify the efforts of nearly fifty years to simplify plant names so that the ordinary human being can understand them. It is hoped that the horticulturists will continue to call them Aldenham, Charlotte, Eley, Hoopes and Nieuwland and refuse to follow blindly the worshippers of sacred priority. American horticulturists should make it clear to the present rule makers that they want and intend to use simple common sense names rather than unspellable and unpronounceable ones.

Peculiarly enough, but presumably in accordance with the present elaborate rules, the book uses the good English names of Arnold, Madgeburg, Parkman, Sargent and Scheidecker in place of their Latin equivalents. It has also made exceptions to the rule of retaining original names, such as shortening to Dittmann the longer but rather pleasant sounding name of Frau Luise Dittmann, thus taking away the compliment intended to the lady. If exceptions can be made in such cases, it is strange they cannot also be made to such names as Aldenhamensis.

In addition to line drawings, the book has four beautiful color photographs which, more than any words, show the value of crabapples for our gardens. Everyone who has room for any flowering trees should own and study this book.

JOHN C. WISTER, *Director*
Arthur Hoyt Scott Horticultural Foundation
Swarthmore, Pennsylvania

THE GARDENS IN THE ROYAL PARK AT WINDSOR. Lanning Roper. 128 pages, illustrated, indexed. Doubleday & Company, Inc., New York. 1959. $10.00.

Among the truly great gardens of the world are the plantings at Windsor Great Park, and it is with astonishment that one learns from this superb book how very recently, in the 1930's they were instituted. The terrain is enormous; the background of ancient trees and water and the happy irregularity of the ground are unparalleled. So was the genius of Sir Eric Savill, the inspired landscape gardener.

The gardens are indeed catholic. They include vast areas of rhododendrons, azaleas, magnolias and many other shrubs, spring bulbs, primulas, lilies, camellias and rare herbs and vines of all kinds that will grow in that climate.

They are open to the public, and the effort has been, not to make a collection for itself, but to plant for the pleasure of the eye of man. The effort has been brilliantly successful as the forty-five colored plates and the fifty-five monochrome plates so generously show.

Even those who garden on a lesser scale will plant their own grounds more wisely as to color and form and association of plants after reading the eloquent text. The philosophy at Windsor has been not so much a garden here and there, however lovely, with "space" between, but the entire landscape has been treated as a worthy and unified field for display.

FANNY W. PARSONS
Harrison, N.Y.

GARDENS OF JAPAN. Tetsuro Yoshida. 187 pages, illustrated, indexed. Translated from German by Marcus G. Sims. Frederick A. Praeger, Inc., New York. 1957. $12.50.

European and American gardens differ in idea and plan from Japanese gardens, generally being more or less geometric in design and usually polychrome. In contrast, the Japanese garden is monochrome and always a landscape garden. The numerous species of flowers to be found in Japan are all grown outside the garden proper.

A further quality, now emphasized in American gardens, is the close connection between house and garden. In Japan, this intimacy of house and garden goes back to ancient times. Although all Japanese gardens are landscape gardens, they are in greatly reduced scale; they copy Nature symbolically rather than faithfully.

Spiritual considerations also have a part in Japanese gardens; Zen Buddhism influenced their development (as did the tea ceremony). They are places of quiet and reflection, and this intention is based on a religious and philosophical demand.

The text gives the general development, history, and types of gardens in Japan, and there are some one hundred and fifty illustrations, 117 of which are full page halftones, and four are in full color. There are numerous sketches.

A selected bibliography and name index conclude this beautiful book, a treasure to be added to one's library. Included and illustrated in detail are the following aspects of Japanese gardens: lakeside, waterfall and bridge; stepping-stones and garden path; stone water basin and stone lantern; tea-house and garden arbor; garden plants and trees; garden fences.

LOUIS BUHLE
Brooklyn Botanic Garden
Brooklyn, New York

A CALIFORNIA FLORA. Philip A. Munz. 1681 pages, illustrated, indexed. University of California Press, California. 1959. $11.50

The eagerly awaited new flora of California has appeared much sooner than might have been expected, only about a dozen years after word was received that it was in preparation. The original plan was that it be done by P. A. Munz, D. D. Keck, and J. T. Howell. The pressure of other duties made it necessary for Mr. Howell to restrict his contribution to *Carex* (by far the largest genus in the California flora, with 144 species) and to consultation in some other groups. Dr. Keck found time to do *Rumex*, *Poa*, and well over half of the Compositae—about ten percent of the total flora, plus the sequence of families, the glossary, the biographical data and abbreviations for authors' names, and much of the editing and proofreading. Except for a few groups that were farmed out to other botanists (notably *Astragalus* and *Oxytropis* to R. C. Barneby, and Cyperaceae except *Carex* to Verne Grant), the remainder of the flora is the work of Dr. Munz, who continues to display the energy, drive and perseverance for which he has long been noted. Under these circumstances, it is perhaps understandable, though regrettable, that at the last moment it was decided to list Dr. Keck as collaborator instead of co-author, since library cards and the back cover of the book will not now carry his name along with that of Dr. Munz.

The greatest difficulty in floristic study is that if one takes time to work out all the problems he encounters he will never get a flora written. Dr. Munz seems to have achieved a satisfactory compromise between the conflicting pressures. He has, of course, made use of existing monographs, and even of the still unpublished manuscript for the fourth volume of Abrams' Illustrated Flora of the Pacific States, but he has evidently borrowed with discrimination, and one is surprised at the amount of independent study he has managed to give groups on which there is no recent authoritative treatment.

As one who is interested in the general system of plants, I am gratified to see that the names Spermatophyta, Gymnospermae, and Pteridophyta have been abandoned by the authors, with five divisions of vascular plants being recognized (for California) instead. It is unfortunate that the sequence of angiosperm families, which is evidently based on Besseyan principles and intended to reflect modern knowledge and thought, is not further explained. Some of the intent is obvious, such as in the placement of the *Empetraceae* directly after the *Ericaceae*, but it is difficult to discern the broader outlines of the system from the linear sequence.

In size, format, and paper, the new flora is much like the current (8th) edition of Gray's Manual, with indented keys and moderately full descriptions. One species (seldom more) in each family is illustrated. The richness of the California flora is shown by the fact that the book treats nearly as many species about (five thousand) as Gray's Manual, in an area less than one fourth as large.

The Munz and Keck flora will immediately become the standard flora of California, and should remain so for several decades.

ARTHUR CRONQUIST

FOREST FIRE CONTROL AND USE. Kenneth P. Davis. 573 pages, illustrated, indexed. McGraw-Hill Book Co., Inc., New York. 1959. $12.00.

This book by Professor Davis and his collaborators presents a complete description of forest fire control in the United States, the basic factors affecting fires and measures for controlling them. Published as an addition to the growing list of works in "The American Forestry Series," it will undoubtedly be accepted as the standard text in its field.

Part One deals with effects and behavior, kinds of forest fires and the influence of forest fires on forest types. Such things as the effect of fire on trees, on forest microclimate, on vegetation and soil are explained. Forest fuels and their combustion with a description of the fire triangle, fuel-

(Continued on page 35)

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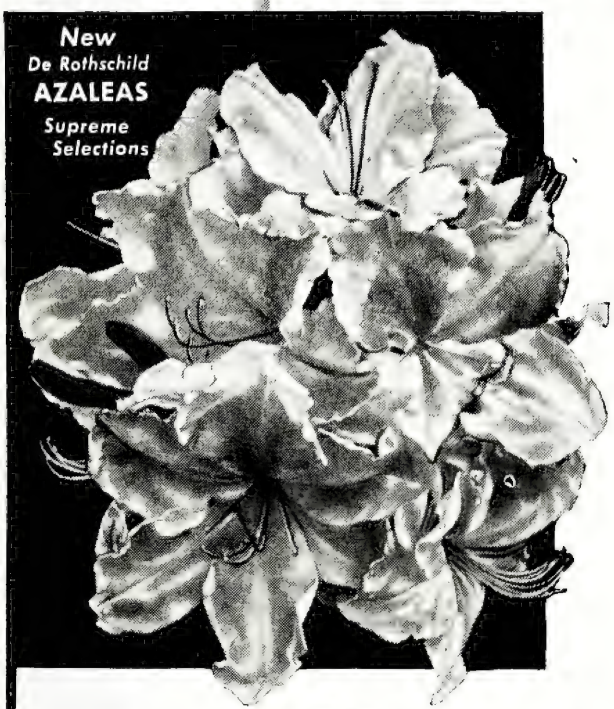

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New ALTHEA, *Blue Bird* brings sky-blue beauty to your borders with magnificent single blossoms that measure a full 5 inches in diameter. They have a clarity of color never seen in any other Althea. Plant in sun, sit back, and watch Blue Bird flourish.

New ABELIOPHYLLUM, *Distichum,* called white forsythia, is a most beautiful conversation plant. Palest pink when buds open, this 3½ foot, sun-worshiping shrub soon turns into the most welcome snow-white Spring flower-drift you've ever seen.

New VIBURNUM, *Pink Beauty* is a pink Tomentosum that surpasses all other shrubs for delicate and bountiful beauty. Flowers open white and gradually turn to clear, sunset pink. Amazingly, it prefers only the simplest of care.

New MALUS *Red Jade.* A two-season beauty that originated in New York's famous Brooklyn Botanic Gardens. In Spring, this softly weeping tree is a flower-fall of white; in Autumn, the fruit ripens to striking scarlet, a marvelous display.

New ROBINIA, *Friesia* makes a bright three-season showing as patio or lawn tree. Spring brings pale yellow leaf buds that open to rich gold plumes, slowly turning copper as Fall approaches. Thorns gleam red; the shoots, orange—unforgettable color fantasy.

NEW HARDY PHLOX
Starfire

The NEWEST *and hardiest* PERENNIALS

New DICENTRA, *Bountiful* is a non-stop bloomer. From bud-break in Spring through mid-summer, it produces masses of fuchsia-red flowers that are almost double the size of the common Plumy Bleeding Heart. Early Fall to frost, blossoms again cover its handsome dark green foliage.

New GENTIANA, *Makinoi,* makes a lovely spot of color in late Summer and early Fall gardens. A deep Gentian-blue, celebrated in song and story, new Oriental-import *Makinoi* grows about 12 inches tall and has been proven exceptionally hardy by Wayside testing.

HOSTA, *Thomas Hogg.* An unusually handsome border plant. Large, glossy leaves of richest green are dramatically edged in silver. In early Fall, its lovely lavender flowers are a charming accent.

New PHLOX, Symons-Jeune Hybrids, created in England, bring to your Phlox collection extreme hardiness, exquisite clarity and variety of color plus extraordinary abundance of blooms shading from white to brilliant orange-scarlet and deep salmon-pink.

New PHLOX, *Starfire,* a sure-fire hit in any man's garden, brings you right into the collector's class among phlox-men. *Starfire* is the only true-red Phlox. Rare as a true-blue friend and as easily cultivated as the most casual of acquaintances.

New SEDUM, *Indian Chief* provides a gorgeous spot of color in your Fall border. All during the Spring and Summer it offers an oasis of cool, gray-green foliage, then in cooler weather, it tops itself with red-copper blooms that would be stunning against a background of Wayside Chrysanthemums.

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Wayside Gardens

NEWS, NOTES and COMMENTS

Contributions to the New Library Wing. In the brief time that the drive for funds for the proposed library wing has been under way, over $100,000 has been subscribed. This excellent beginning is largely due to the initiative and devoted attention on the part of Mrs. Hermann G. Place, Vice-President of The New York Botanical Garden and Chairman of the Building Committee, who is spearheading the campaign. Contributions have been made by members of the Board of Managers, members of the Advisory Council, and other members of the Garden. The Advisory Council is contributing to the office of the Director in the proposed wing.

Several members of the Garden have sent in pledges in addition to their original contributions.

Dr. William C. Steere, Director of The New York Botanical Garden, has said, "There is no question that we can look forward to the marvelous reality of a new library wing in the not too distant future."

Membership. Another six hundred members have been added to The New York Botanical Garden from many areas in the United States and from as far as the Bahamas and Brazil.

Mrs. Eileen Kene, Membership Secretary, will send literature and an invitation to join The New York Botanical Garden to any relative or friend of a member of the Garden, whose name and address are furnished.

Educational Program. According to T. H. Everett, Assistant Director (Horticulture) and Curator of Education, the Educational Program at The New York Botanical Garden is going well this year, largely through the fine teaching by members of the staff. 1,021 registered for courses in the fall term. The winter term starts on January 4, 1960 with the course in Systematic Botany II. The course in Flower and Vegetable Gardening begins on January 7, and the course in Planning the Home Grounds on January 19.

National Science Foundation Grants to the Garden. The New York Botanical Garden has been awarded $23,500 by the National Science Foundation for the support of basic research entitled, "American Lauraceae: Taxonomy and Geographical Distribution," under the direction of Dr. Caroline K. Allen, Visiting Research Associate. The grant, which became effective October 1, 1959, will be three years in duration.

The Garden has been awarded a grant of $4,750 by the National Science Foundation for the support of basic research entitled, "Pilot Study of Application of Electronic Data Processing Devices to Systematic and Economic Botany," under the direction of Dr. David J. Rogers, Curator of Economic Botany, and Sidney W. Gould, of Madison, Connecticut. The grant, four months in duration, became effective October 16, 1959.

Dr. William C. Steere, Director, addressed the Council of the U. S. National Arboretum in Washington, D.C., in October on The New York Botanical Garden. The Council was interested in learning about the Garden, as the two institutions have many similar problems.

Dr. Steere, during the past several months, attended a luncheon of The Nutrition Foundation at the Waldorf-Astoria, New York City; meetings of the Committee of Biological Editors of the American Institute of Biological Sciences, of the Advisory Committee on Institutional Grants of the American Cancer Society, of the Steering Committee of Biological Sciences Curriculum Study, and of the American Association for the Advancement of Science. He also gave his presidential address to the American Society of Plant Taxonomists.

Dr. Steere Contributes to Two Books. In Nielsen's book on UNIVERSITY ADMINISTRATION IN PRACTICE, Dr. Steere brings his experience as Dean of the Graduate Division of Stanford University to bear on the financing of basic research. He discusses, among other things, the part played by the university in encouraging research, and the sources of grants to support it.

In READING FOR LIFE, Dr. Steere discusses the reading habits of college students, especially of those scientifically inclined, American anti-intellectualism, the problem of communication between scientist and layman, the introduction of the student to a library, the teaching of science, and, in general, the importance of reading to all students, in science as well as the humanities.

Staff Activities. T. H. Everett, Assistant Director (Horticulture) and Curator of Education, and Louis P. Politi, Horticulturist, who visited the Montreal Botanical Garden this past fall, were impressed with its magnificent plant collections. From a plantsman's point of view, they comprise in variety, quality and number of plants the finest in North and South America. There are fine new greenhouses and conservatories, some still under construction, others not completely planted.

Dr. Clark T. Rogerson, Curator of Cryptogamic Botany, participated in the annual foray of The New York State Mycological Society. Two rainy days were followed by three clear days, so there were a number of fungi for collection in the area visited in the Adirondacks. Participants came from Great Britain, Switzerland, Ottawa, Saskatchewan, and Kentucky as well as local points.

Dr. David J. Rogers, Curator of Economic Botany, attended a meeting of the officers and Council of The Society for Economic Botany in Washington, D.C. According to the agreement between the Society and The New York Botanical Garden, Dr. Rogers is now managing editor, and Dr. Bernice Schubert has been appointed technical editor, effective February 1, 1960. Dr. Richard M. Klein, Alfred H. Caspary Curator, has been named the Society's treasurer.

Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer, has revised the bibliographies to standard form on all the papers presented at the Fourth International Congress on Plant Growth Substances in preparation for the book to be published by Iowa State College in May 1960. Dr. Klein is Chairman of the Editorial Committee responsible for the book.

Dr. P. P. Pirone, Plant Pathologist, was the speaker at the staff seminar in November—his subject, "The Response of Shade Trees to Natural Gas." Dr. Pirone has completed the revision of Dodge and Rickett's DISEASES AND PESTS OF ORNAMENTALS. The revised book, bearing the same title, by Pirone, Dodge and Rickett will be published in spring 1960 by Ronald Press Co., New York.

Dr. Arthur Cronquist, Curator, has been added to the list of instructors in the Department of Botany at Columbia University from the Garden.

Stephen S. Tillett completed the requirements for his doctorate at Claremont College in California during October. Dr. Tillett, Research Associate, is working on the tropical program under Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research. Dr. Maguire, who has been on an expedition in northern South America since August, is expected to return to the Garden in January. His itinerary has included Colombia, Bolivia, Peru and Brazil.

Lubbert Westra, a graduate assistant from the University of Utrecht, arrived in October to be an assistant in the herbarium until July 1961, when he will return to Utrecht to complete his doctorate. Mr. Westra will accompany Dr. John J. Wurdack, Associate Curator, on his next plant collecting expedition to northern South America. They plan to leave in January 1960.

Dr. Elsa O'Donnell, a student of Dr. Oscar Kühnemann in the Department of Botany, Faculty of Exact and Natural Sciences, University of Buenos Aires, Argentina, has been appointed a visiting investigator in the Research Laboratory. Dr. Irma Gamundi-Amos, another student of Dr. Kühnemann, has been using the facilities of the laboratory and herbarium.

Arthur M. Anderson resigned as a member of the Board of Managers of The New York Botanical Garden on October 29, 1959, having been a member of the Board since January 1933. Mr. Anderson served as treasurer of the Garden from 1938 to 1952, and has been a member of the Corporation since 1933.

Visitors to the Garden. Within recent months, the following have visited The New York Botanical Garden:

Dr. Agathe L. van Beverwijk, Director of Centraalbureau voor Schimmelcultures, Baarn, The Netherlands.

Dr. John D. Bu'Lock, University of Manchester, England.

Dr. Ivan M. Johnston, Arnold Arboretum, Harvard University, Cambridge, Mass.

Dr. Richard A. Howard, Director, Arnold Arboretum, Harvard University, Cambridge, Mass.

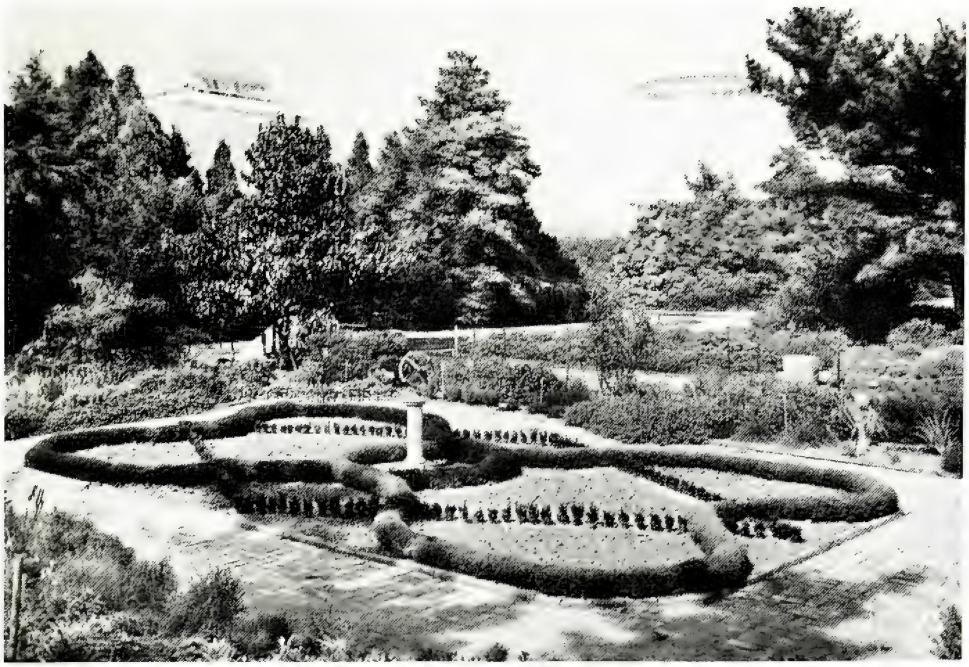
Dr. Donald Wyman, Horticulturist, Arnold Arboretum, Jamaica Plain, Mass.

Dr. Russell J. Seibert, Director of Longwood Gardens, who addressed a staff seminar on Longwood Gardens.

Gustav F. Herbst, Rye, N. Y., who presented the Library with a collection of seed catalogs of the latter part of the nineteenth century, on behalf of Captain Frank Jaeger, Rockport, Me.

R. T. Koenig, Research Librarian, Fritzsche Bros., New York, N. Y.

Dr. Benjamin Blackburn, Drew University, Madison, N. J.



Members of the New York Unit of the Herb Society of America participated in Open Garden Day, October 14, 1959, at The New York Botanical Garden as hostesses in the Herb Garden and in the adjacent Study Collection of Herbs. The Herb Garden was recently replanted and the Study Collection added, with the cooperation of the New York Unit.

Left. Mrs. Charles Colton Lawrence, Chairman for the Day on October 14, 1959, and Mrs. A. Sumner Gambee, Chairman of the New York Unit.

Dr. Robert K. Zuck, Drew University, Madison, N. J.

Dr. H. J. Scoggan, National Museum of Canada, Ottawa, Ontario.

Dr. Raymond Weibel, Conservatoire et Jardin Botanique, Geneva, Switzerland.

Dr. Warren H. Wagner, Jr., University of Michigan, Ann Arbor, Mich.

Dr. David D. Keck, National Science Foundation, Washington, D.C.

Dr. Richard S. Cowan, U. S. National Museum, Washington, D.C.

Dr. Wladyslaw Szafer, Polish Academy of Sciences, Krakow, Poland.

Dr. Tobías Lasser, Instituto de Botánico, Caracas, Venezuela.

Dr. R. D. Hoogland, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia.

Mr. and Mrs. Roy Arthur Hunt, Pittsburgh, Pa.

Dr. Frits P. Jonker, Botanical Institute, University of Utrecht.

Recipients of degree of Docteur ès-Science from the University of Montreal, August 21, 1959. Left to right: Dr. Stanley A. Cain, Head of the Department of Conservation, University of Michigan; Dr. C. G. G. J. van Steenis, Director of the Flora Malesiana Foundation, Leiden; Dr. William C. Steere, Director of The New York Botanical Garden; Monseigneur Irenée Lussier, Rector, Université de Montréal; Dr. Pierre Chouard, Head, Laboratoire de Physiologié Végétale de la Sorbonne, Paris; Dr. Eric Hultén, Director of the Botanical Department, Naturhistoriska Riksmuseum, Stockholm.

A New Species of Justicia Named in Honor of George R. Cooley. Through the support of George R. Cooley, it has been possible to prepare for the herbarium of The New York Botanical Garden a large collection of southeastern United States plants collected by John K. Small and co-workers twenty-five to forty or more years ago. This has lain in storage until now.

Even without systematic study, several interesting specimens have been discovered in this rich material, the most outstanding being a new species of *Justicia* from Florida which has been named *J. cooleyi* by Joseph Monachino of The New York Botanical Garden and Emery C. Leonard of the Smithsonian Institute. *J. cooleyi* was published and illustrated in the July 1959 issue of RHODORA.

Upon being advised of the new species, Mr. Cooley collected copious fresh material from the type locality at Indian Hill and subsequently discovered it growing at Chinsegut itself near the colonial mansion where he resided. An article on Chinsegut Hill appeared in THE GARDEN JOURNAL of The New York Botanical Garden for September 1958.

George R. Cooley was an investment broker until his retirement five years ago. He is now devoting his unflinching efforts on a long-time botanical project which will ultimately culminate in the printing of an up-to-date manual of the southeastern flora.

JOSEPH MONACHINO

'Chanseonette,' a camellia sasanqua seedling, is the first to receive the Ralph Peer Sasanqua Cup. 'Chansonette' was developed by Miss Marjorie Wishburne of Port Arthur, Texas, and the original plant is now eight years old. It is being propagated for release in fall 1960, by Eagleson Nursery, Port Arthur, and Neccio's Nursery, Altadena, California.

The Ralph Peer Sasanqua Cup is made available for the best sasanqua seedling in any one year by Ralph S. Peer, past president of the America Camellia Society.

New Varieties of Fruit. A new peach, 'Collins,' named in recognition of many years of service to peach growers by the late Lester Collins, Moorestown, New Jersey, is described by Dr. H. W. Martin, Director of the Station, "as the earliest-ripening, yellow-fleshed peach ever introduced by the New Jersey Agricultural Experiment Station." The tree was bred by Dr. L. Frederic Hough and Dr. Catharine H. Bailey of the Department of Horticulture.

Three new strawberries, 'Fletcher,' 'Frontenac,' and 'Fulton,' developed by Dr. George L. Slate of the New York State Agricultural Experiment Station, Cornell University, have been on trial at the Station for several years. Limited stock is now available for more extensive testing by commercial and home fruit growers.

Wayside Gardens 1960 Introductions. Among the new, or little-known, plants which Wayside Gardens, Mentor, Ohio, are introducing this year is clematis 'Mrs. P. T. James,' which freely produces large, double, blue flowers on well-established plants. It is reported that the first year this clematis is planted, it will bear both single and double flowers; but thereafter blooms are fully double.

Wayside's rose offerings include 'My Choice,' which was awarded the Clay Challenge Cup for the best scented British rose of 1958 and the National Rose Society medal. It has a strong damask fragrance. The bud, which is yellow splashed with vermillion, opens to reveal petals lemon-yellow outside, carmine within. The colors

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pale as the flower opens fully to a soft silvery pink with the old world yellow of the tea rose on the reverse of the petals.

Three of their spiraeas include *S. arcuata,* from the Himalaya Mountains, which seldom grows more than three or four feet high and blooms profusely. The pure white flowers in June and July are followed by conspicuous mahogany-red seed clusters. This is a shrub for small gardens, as it does not have to be sheared so often in order to keep it a desirable size. Another spiraea for small gardens is *S. arguta compacta;* its neat habit of growth and height of three feet are characteristics which recommend it as a hedge plant. The third member is *S. sanssouciana,* which was developed by the German botanist, B. Koch. This is a little taller than the other two, as it may reach five feet in height at maturity. It is hardy, will grow in any reasonably good soil, has attractive blue-green foliage, and in June and early July upright panicles, twelve inches long, of a rosy hue.

Readers of THE GARDEN JOURNAL who may be thinking of acquiring a greenhouse so that they can have the pleasure of growing plants the year round, will find answers to some of their questions on design, size, location, foundation, heating, in a booklet YOUR NEW GREENHOUSE. It may be had on request from Lord and Burnham, Irvington on Hudson, New York.

Europe—1960 is a springtime tour scheduled to leave New York April 18 via the S. S. Rotterdam of Holland-America Line (April 25 via KLM Airlines) with T. H. Everett, Assistant Director (Horticulture) of The New York Botanical Garden, conducting the tour to Holland, Belgium, Switzerland, Italy and France.

Among the points of interest to be visited are "Floriade," the International Horticultural Exhibition at Rotterdam and the tulip fields in Amsterdam; also the "Floralies," the famous flower show at Ghent, and the botanical gardens and King's gardens in Brussels. Information on Europe—1960 may be obtained from Transmarine Tours, Inc., New York.

Sogetsu Floral Art, Inc., is the official counterpart of one of the foremost schools of Ikebana, creative flower arrangement and allied arts in Tokyo—the Sogetsu Ryu School, directed and founded by Sofu Teshigahara.

Teshigahara's American teaching representatives in the United States is Madame Kazuko Ogura. Mme. Ogura, who holds seven diplomas in the art, has taught advanced flower arrangements for twenty years and has exhibited arrangements and her sculpture abroad. She has also been called upon to create special arrangements for the Emperor and the Crown Prince on occasions of imperial significance. Miss Teruko Hatazawa assists Mme. Ogura in teaching.

The Sogetsu School in Tokyo, designed by Kenzo Tange, was awarded the Grand Prix at the 1958 International Architectural Concourse in Paris.

Dr. Philip A. Munz, Director of the Rancho Santa Ana Botanic Garden and Professor of botany at Claremont Graduate School, who recently returned from six months abroad, reports that many plants, native to California, are cultivated in Europe. This was particularly interesting to Dr. Munz, who collaborated with Dr. David D. Keck on A CALIFORNIA FLORA. Dr. Keck, who was formerly assistant director and head curator of The New York Botanical Garden, is now Program Director for the Biological Sciences, National Science Foundation.

Dr. Munz made the trip to Europe under the auspices of the National Science Foundation, from which he was the recipient in 1957 of a $10,000 grant for research on the evening primrose family. While in Madrid, where he had gone because of the collection of evening-primrose genera in the herbarium, Dr. Munz studied and identified specimens of plants brought from Mexico in the 1800's.

Dr. William Stern, Curator of the Samuel James Record Memorial Collection, School of Forestry, Yale University, gave an illustrated talk on his expedition to the Province of Darien, Panama, before the Torrey Botanical Club at the meeting held at The New York Botanical Garden on November 3, 1959. Dr. Steere's talk will be published in a forthcoming issue of THE GARDEN JOURNAL under the title, "Plant Collecting in the Land of Balboa." At the November 17, 1959, meeting held at Columbia University, Dr. William Jacobs of Princeton University lectured on "What Makes Leaves Fall."

Dr. G. S. Puri, M.Sc.Hon., Ph.D. (Luck.), Ph.D. (London) has been appointed Director of the Central Botanical Laboratory, Allahabad, succeeding Dr. E. K. Janaki Ammal, who was the first director and has just retired.

The Laboratory has four divisions—ecology, physiology, cyto-genetics and economic botany. Its main function is to study the different aspects of plants' relationship with their environment with a view to clarifying the systematic position. The emphasis is laid on plants of economic importance.

Dr. Puri has had a varied experience through his twenty-five years of botanical career. He has gained international fame in palaeobotany, phyto-geography and ecology and has enjoyed the privilege of working with Prof. Birbal Sahni at Lucknow and Prof. W. Pearsall at London. He was forest ecologist at the Forest Research Institute, Dehra Dun, for about two years, and during the last three years, as regional botanist of the Western Circle of the Botanical Survey of India, completed a reconnaissance survey of the vegetation of western India. Dr. Puri has published about two hundred botanical papers and two major books, INDIAN MANUAL OF ECOLOGY and FOREST ECOLOGY.

Citations at the American Horticultural Congress, Rochester, New York, October 7-10, 1959, were presented to Thomas P. Reilly, Dansville, New York, as announced in the November-December issue of THE GARDEN JOURNAL; to Eugene S. Boerner, Newark, New York, for hybridizing chrysanthemums, delphiniums and other plants, and especially for originating roses for greenhouse and garden culture; to Henry J. Kohankie, Painesville, Ohio, for a lifetime devoted to the propagation and production of high-quality plant material and

to making such material available to the gardens of America, and for elevating the standards of nursery practice and business ethics; to Fred F. Rockwell, Orleans, Massachusetts, for a lifetime devoted to gardening and horticultural journalism, and for promoting through writing, lecturing and photographing an interest in plants and many types of garden practice; and to John Nash Ott, Winnetka, Illinois, for time-lapse photographic techniques and for utilizing this skill in popularizing gardening and in broadening the knowledge of gardeners and plant scientists in aspects of plant life not easily observed.

The American Horticultural Council also awarded the F. A. Bartlett medal for outstanding contribution towards the appreciation and care of ornamental trees to Bernard H. Slavin. Mr. Slavin started as a laborer in the Rochester, New York, park system in 1890 at the age of eighteen; was foreman of Highland Park 1895-1903, of Seneca Park 1903-1911; assistant superintendent 1911-1928; and superintendent of parks 1928 until his retirement on May 1, 1942, at the age of seventy. This was the first time this medal, made possible as an A.H.C. award through the generosity of F. A. Bartlett, Stamford, Connecticut, and designed by Edmond Amateis, Brewster, New York, was presented.

The Liberty Hyde Bailey medal was awarded to Benjamin Yoe Morrison, Pass Christian, Mississippi, who was for many years principal horticulturist in the division of plant exploration and introduction, Bureau of Plant Industry, U.S.D.A., first director of the U. S. National Arboretum, and editor of THE NATIONAL HORTICULTURAL MAGAZINE, and has made valuable contributions to ornamental horticulture through his work with azaleas, rhododendrons, narcissi and other plants.

One of the important actions of the Fourteenth Annual American Horticultural Congress was the approval by the members, in plenary session, of the merger between the American Horticultural Council and the American Horticultural Society, which is expected to become effective early in 1960. Officers of the Council elected to serve during the interim are: Dr. Richard P. White, Executive Vice-President of the American Association of Nurserymen, as President; Carl Fenninger, John J. Tyler Arboretum, as First Vice-President; William H. Frederick, Jr., Hockessin, Del., as the Second Vice-President; Dr. Donald Wyman, Horticulturist of the Arnold Arboretum, as Secretary-Treasurer. New Members of the Executive Committee are Mrs. Jesse F. Hakes, Jerome A. Eaton and Charles D. Webster of the Horticultural Society of New York, Harold Epstein of the American Rock Garden Society, Dr. William E. Snyder of Rutgers University, and Mrs. Dorothy Ebel Hansell, Editor of THE GARDEN JOURNAL. Mrs. Hansell represented The New York Botanical Garden at the Congress.

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BOOK REVIEWS (from page 30)

water relationships, mechanisms of fire propagation and the early life history of a fire is covered. The differences between large and small fires, the blow-up fire, interpretation of fire behavior warning signals and the future of fire behavior sirens is well presented. Fire weather is described in detail with temperature, air moisture and atmospheric conditions, pressure systems, winds, thunderstorms and special conditions that encourage fire spread. The fire danger rating system and how it is used is explained.

Part Two covers the control of forest fires. It deals with the prevention of man-caused fires; fire causes and occurrence; hazard reduction, detection, fire suppression methods and tactics; control line building, and a description of mechanized equipment used. The use of chemicals, water and air-tankers are mentioned. The building and operating of the fire control organization and the need of training personnel for large fires is emphasized. A case history of large fires is presented.

Part Three covers the objectives in fire control, the use of fire in forest land management especially as a silvicultural tool, and the development and status of forest fire control in the United States. The term "backfiring" described on page 317 seems to be used interchangeably with the terms "line firing" and "burning out." A glossary of words and terms peculiar to forest fire control would be a desirable addition.

While it is understood that the work is intended to apply primarily to the United States, it would seem as though some mention of the development of air tankers by the Ontario Department of Lands and Forests in 1957 would have contributed measurably to an understanding of this technique.

CLARENCE A. PETTY
New York State Conservation Department

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THE NATIONAL FORESTS. Carhart, Arthur H. 289 pages, illustrated, indexed. Alfred A. Knopf, New York. 1959. $4.75.

Conservationist Arthur Carhart presents a guided tour of our forest heritage, the National Forests. First, he tells the history of forest conservation and the establishment of our National Forest system primarily to protect watersheds and grow wood but also for livestock grazing, recreation, and wildlife.

Then he takes us into the ten administrative regions of the United States Forest Service, one by one, stressing their main features. In various National Forests he describes the geology and history, mountains and scenery, meanings of names, kinds of trees, game and other wildlife, and special products. Throughout he emphasizes conservation, particularly the protection provided by the forest cover against erosion and floods. The "tin-roof" watershed theory is severely criticized, and misuse of watersheds is illustrated by overgrazing and excessive erosion.

Much factual reference material has been accurately presented in narrative form with personal experiences and anecdotes for pleasant reading. Statistics are scattered inconspicuously.

Suggestions about where to go on forest outings and vacations are numerous. The Appendix lists the National Forests and regional headquarters with addresses, where readers may obtain additional information.

Twenty-four pages of Forest Service photographs illustrate activities on our National Forests. A larger, more detailed map of the United States showing names and locations of National Forests would be a useful addition to future printings.

The legend that Oregon-myrtle is found only in southwestern Oregon and the Holy Land is repeated. As confirmed by the tree's other name, California-laurel, the second place means California!

ELBERT L. LITTLE, JR.
United States Forest Service
Washington, D. C.

INDUSTRIAL MICROBIOLOGY. Samuel C. Prescott and Cecil G. Dunn. 3rd ed., 945 pages, illustrated and indexed. McGraw-Hill Book Co., New York, 1959. $17.50.

Microbiological transformations of steroids make possible the production of many of the pharmaceutically active steroids now prescribed so extensively. Without the highly specific actions of microorganisms, the number of steroids used in medicine would be fewer and they would be more expensive. Production of several amino acids has been developed, especially by Japanese workers, to provide a cheap source of nutritionally important amino acids. These are but two examples of the many economically important industrial microbiological processes.

The third edition is a revision by C. G. Dunn of the second edition to include the open literature which appeared in the period from 1947 to 1956 as judged by the literature citations. Old chapters were reduced in size or were dropped to make room for the new material so that the revision gave a book with only twenty-two pages more than the previous edition. Chapters omitted were: "Textile Microbiology," "The Microbiology of Wood," and the two appendixes. The new chapters reflect the areas of interest that developed in the decade between the two editions. They are: "Vitamin Production by Yeasts and Yeast-like Microorganisms," "Dextrans," "Production of Vitamin B_{12}," "Gibberellic Acid and the Gibberellins," "Ustilagic Acid," "Production of Mushroom Mycelium by the Submerged-Culture Process," "The Production of Amino Acids by Microorganisms," "The Microbiological Transformations of Steroids," and "Some Biochemical Engineering Aspects of Fermentation." Thus, the second supplements the third edition in some parts and should not be discarded. The field of industrial microbiology is so large that no single volume can serve as more than an introduction to it and as a guide to the literature of specific topics. In certain industrially important areas, for example, the production of vitamin B_{12}, riboflavin, steroids, and antibiotics, the book is quite inadequate through no fault of the authors; the pertinent information has not been published and probably will not be. Many of the yield figures given in the book are at least an order of magnitude lower than current industrial accomplishment.

The five pages devoted to the assay of penicillin gives the reader a poor idea of the difficulty and complexity of microbiological assays. The most used chemical method for assay of penicillin, the hydroxamic acid method, is not given in the list of chemical methods.

F. KAVANAGH
Indianapolis, Ind.

THE ORCHIDS. Carl L. Withner (ed. by). 648 pages, illustrated, indexed. Ronald Press Company, New York. 1959. $14.00.

THE ORCHIDS—A Scientific Survey, edited by Carl L. Withner, is a book that will live!

Here is the product of a specialist who has digested the orchid literature which has gone before, and has sifted out the vital and useful information required for a basic knowledge of all that has to do with orchids.

The author has marshalled the knowledge of the best technicians on specific subjects of orchids and by-lined these articles for valuable reference. The chapter "Key to the Orchids," can take a bow!—twenty-five pages anyone can understand. The sixty pages of line drawings, some with fifteen subjects, make identification of various genera and species exhibited in orchid shows by new orchidists an enjoyable, simplified chore!

Withner's own chapter on orchid physiology saves the reader endless research, as does "Hybridization and Inheritance of Orchids."

Today, chromosome counting in the orchid field is as popular as the cross-word puzzle and just as tantalizing, so Withner presents sixty pages to feed the chromosome-hungry fans.

The breeding enthusiasts are not forgotten and well-known formulas of culture media and nutrient solutions are at fingertip reach.

Between the covers of this work is bound the kind of essential research you, yourself, may often have wished might be done.

RODNEY WILCOX JONES
New Rochelle, N. Y.

OLD ROSES FOR MODERN GARDENS. Richard Thomson. 154 pages, illustrated. D. Van Nostrand Company, Princeton, N. J. 1959. $7.50.

With his beautifully illustrated lectures, this enthusiast must have persuaded many to collect "the old roses." Now his experiences with them in his garden near Philadelphia are reflected in the first American book on the subject since those of Mrs.

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Keays and Francis Lester. Much research and rediscovery have gone on since their time, inclusion of which gives this text special value for the amateur.

Introductions to the chapters beneath each main group—"Old European Roses," "Old Oriental Roses," and "The Species," where he lists those not included before—add further details to the summary of rose history, all of which are fascinating to the rose addict. For each chapter there is a recommended list, based on those grown by the author. The numerous illustrations are notable—many of the color photographs were taken by him in his garden, all refreshingly honest portraits.

This is a handsome gift book which fills a useful place between Roy Shepherd's important rose history and Graham Thomas's THE OLD SHRUB ROSES, which, while more authoritative and also more charming, is based on the much longer lists available in England and (It has been published in America.) R. C. Allen forgets such men as these in his introduction. You will have to turn either to Thomas or old Bunyard for clear instructions as to soil and pruning.

To consider species, species-hybrids, hybrid perpetuals and all other hybrids up to 1900 as "old roses" extends this field beyond the range of the older writers. A text tying them all into their places in history enlarges the viewpoint of the amateur, and should increase interest in hybridizing.

Those who already grow these enchanting flowers will, of course, find points of difference and omission of their own favorite, but few will have grown as many as Mr. Thomson, or even have seen them in nurseries.

MRS. EDWIN DeT. BECHTEL,
Mount Kisco, N. Y.

HANGING FLOWER AND PLANT DECORATIONS. Zelda Wyatt Schulke. 125 pages, illustrated, indexed. Hearthside Press, Inc., New York, 1958, $3.95.

This book is devoted to hanging arrangements—in pots, baskets, and swags, and to decorations in the form of wreaths, wall plaques, collages, pendants, mobiles, for outdoor as well as indoor living. The reader is urged to make use of versatility, whimsy, and gaiety as well as dignity in depicting original compositions for appropriate hanging decorations.

In emphasizing the fun and beauty of hanging plants and flowers the author points up the hospitable look they give, creating the feeling that nothing has been spared in making the guest's arrival an occasion.

In preliminary research the author learned that very little had been written on the subject. With this in mind, she presents 122 black-and-white photographs of hanging arrangements made by designers throughout the country, including some of her own, to reveal the extensive field such decorations cover. The illustrations include many types of hanging arrangements for use in a wide variety of places.

Each plate is described in detail. The type of container, the names of plants, fruits, vegetables or other natural material that constitute the design, are listed. In each photograph the author calls attention to the material employed to carry out the basic line of the container or of the design.

Mention is made of the importance of repeating the colors of the container or its surroundings in the material selected for the arrangement. Attention is called to the subtle use of contrasts in color and texture as well as to the development of pleasing space relationship. The author names the mediums used to achieve the most pleasing effects. For example, lighting is considered a powerful element of design.

Ideas are given the collector to enlarge the variety and selection of material at hand for his creations. However, the point is stressed that the most ordinary objects may be considered appropriate in the hands of an imaginative designer.

Formulas for the treatment of materials to bring about the desired effects, usually kept secret, are disclosed; so also are sources of material including gadgets, descriptions of construction techniques such as how to hide the mechanics employed in forming the decoration.

For the organization whose goal is a workshop production of a large variety of hanging decorations for sale at the next fair or flower show or house and gardens tour, this book offers a host of ideas. For them, as well as individuals interested in a stimulating, creative art, this book will be invaluable.

MRS. MARCUS FAIR
Tenafly, N. J.

YOUR LAWN—HOW TO MAKE IT AND KEEP IT. R. Milton Carleton. 165 pages, illustrated, indexed. D. Van Nostrand Company, Inc., Princeton, New Jersey. 1959. $3.95

Lawn troubles have been legion over most of the eastern portion of this country in 1959. Many troubled home owners will likely be attracted to this book in the hope it will prescribe the remedy for their lawn troubles. While this book contains some information of value, it is hardly a guaranteed manual for lawn success.

It is obvious the author has had but limited experience with golf course man-

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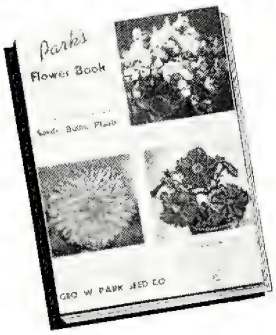

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agement methods. While this reviewer shares Mr. Carleton's enthusiasm for Merion Kentucky Bluegrass, it is not used on golf greens in the Chicago district (page 117) or elsewhere. It has been used with varying success on golf tees. Few agronomists will subscribe to his opinion of the shade tolerance of Merion Kentucky Bluegrass.

The section on lawn building and seed selection is quite well done. The chapter on lawn renovation—the renewal of deteriorated lawns—is skipped over superficially with little reference to proven methods and modern equipment to accomplish the objective. Lawn grass diseases, which are rarely serious on home lawns, are overemphasized. Insects, especially chinch bugs and sod web worms, responsible for much loss of turf in the East this year, get but scant attention. Fine turf agronomists will find much in this book to which they will take exception. Just another book on lawns, easy to read, with but little up-to-date information promised in the foreword.

WARREN E. LAFKIN
White Plains, N. Y.

GARDEN IN YOUR HOUSE. Ernesta Drinker Ballard. 256 pages, illustrated, indexed. Harper & Bros., New York. 1958. $5.95.

Perhaps some of the readers of this journal saw Mrs. Ernesta Drinker Ballard's educational exhibit in the 1959 Philadelphia Flower Show called "House Plants on Vacation." In this exhibit it was presumed the owner was leaving the house unattended for two weeks, and it showed the careful preparations taken to make sure the plants would not suffer. Lace curtains were drawn, thermostat set at 55°, and all the plants but succulents and Bromeliads were imbedded in moss. The African violets were moved onto a table with a miniature plastic greenhouse with controlled heating.

The exhibit illustrated a very careful study of every possible angle, and you will find her book GARDEN IN YOUR HOUSE a very thorough one as well. In the first part it gives general information about culture, and being very up-to-date mentions "Perlite," "Saran Wrap," plastic boxes, and electric heating cables. In part two are illustrations of indoor gardens of all types, mostly from her home with extensive text.

Part three, the most extensive of the book, gives a selection of plants in alphabetic order, with useful tips on the growing of the plants. Special emphasis is given to Mrs. Ballard's favorites.

The last part of the book is called a "Finding List"—finding plants for different exposures and temperatures, finding the right mixture for Bromeliads, African violets, and others, finding books on and suppliers of house plants.

Mrs. Ballard has no sympathy with people who grow plants for the sake of decor only, so anybody who feels that way may become annoyed with her book. She devotes most of her life to her plants and expects the reader to do likewise.

My criticism does not lie in the text of the book but in the poor photographs which do not show the plants to best advantage.

C. BOUTARD
Berkshire Garden Center
Stockbridge, Mass.

SUBCELLULAR PARTICLES. Teru Hayashi, (Ed. by). 213 pages, illustrated, indexed. The Ronald Press Co., New York. 1959. $6.00.

This volume, addressed to "all those who consider themselves students of the cell," has two stated purposes: first, to summarize recent work on the isolation and characterization of subcellular particles, and, second, to correlate at least some of the functional knowledge thus gained with information about the structure of these particles. The papers comprise the 1958 Symposium of the Society of General Physiologists. Recent parallel progress both in cytology, especially in the techniques of electron microscopy and cytochemistry, and in the biochemical investigation of subcellular units isolated from homogenized tissue has enabled biologists to make important discoveries concerning the localization of chemical processes in specific cell organelles and to gain significant insight into other aspects of the relationship between cell structure and function.

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The first three papers deal, respectively, with techniques used to approach the problems, enzyme reactions at surfaces, and structural factors in polymerization. The remainder take up questions of structure and function in mitochondria, the endoplasmic reticulum, Golgi membranes bacterial photosynthetic chromatophores, lysosomes, nuclei, nucleoli, and chromosomes.

The contributors are eminently qualified to discuss their subjects with authority, and the symposium constitutes a valuable collection of reports on recent important advances in cellular physiology.

VIRGINIA C. LITTAU
Rockefeller Institute

THE ACTINOMYCETES. Volume I. Selman A. Waksman. 327 pages, illustrated, indexed. The Williams & Wilkins Co., Baltimore 2, Maryland. 1959. $12.50.

The present book, the first of three volumes, is concerned with the occurrence, nature, and activities of the actinomycetes. The two volumes that follow will deal, respectively, with the taxonomy of the actinomycetes and with their use in the production of antibiotics.

Volume One can stand alone as the most comprehensive treatment of the actinomycetes yet published. A partial list of subjects discussed includes the following: the isolation and cultivation of the actinomycetes; the classification, structure, and life cycles of these organisms; their nutrition and metabolic activities involving the production

of enzymes, vitamins, pigments, and antibiotic substances; and their role in animal and plant diseases.

The author, Dr. Selman A. Waksman, is well qualified to write of the actinomycetes, having studied them in their many aspects for almost fifty years.

The book is printed by the Waverly Press on high quality paper, on which the many excellent photographs are beautifully reproduced.

ALMA W. BARKSDALE

HOW TO KNOW THE MOSSES AND LIVERWORTS. Henry S. Conard. 226 pages, illustrated. Wm. C. Brown Company, Dubuque, Iowa. 1959. $2.50 wire coil binding; $3.00 cloth binding.

This revised edition of "pictured keys for determining many of the North American mosses and liverworts, with suggestions and aid for their study," has been greatly enlarged. It is an excellent handbook prepared for beginners by an authority in this field. Its purpose is to simplify identification of the more common mosses and liverworts through the use of a very workable key with illustrations of the most distinctive characteristics of each of the species. Any serious beginner with a good handlens or a microscope will find this book an indispensable aid in learning to recognize these plants. It is particularly useful when used with the larger manuals and floras.

M. FULFORD
Cincinnati, Ohio

DIE FLORA DER SARMATISCHEN STUFE IN UNGARN. Gabriel Andreanszky. 428 pages, illustrated, indexed. Printed in German. Hungarian Academy of Sciences, Budapest, Hungary. 1959.

The value of this appealingly presented book lies in drawings of almost every species, and in numerous plates permitting the critical investigator to judge specific validity. Considering the limited boundaries of Hungary, a commendable effort is made to evaluate, chart and compare individual floras of the Sarmatian (upper Miocene) horizon, and thus present a unit-guide for central European palaeobotanists.

Unfortunately the author frequently indulges in the already long frowned-upon procedure to determine specifically incomplete specimens, naming fragments that lack tip, base, or margin. In addition, many specimens of a clearly size-variational nature, especially in the *Betulaceae* and the *Fagaceae* are specifically separated. This procedure has resulted in approximately two hundred and forty species, one third of which are "new species" named by the author.

As a correlative work for New World species the volume is of little value. Many of the newly described forms obviously exist in our own Tertiary record, a fact which is vaguely acknowledged by the author in his postscript (Nachwort). Thus the book is, as the title implies, of value only within the boundaries and immediate vicinity of Hungary. A lack of reference to Asiatic, Arctic, and American continental floras detracts considerably from a potential, international interest in this work.

The extensive bibliography is devoid of American or Asiatic references, and it appears deplorable that all collaborators and critics are Hungarians, that none of the neighbouring eminent French or German palaeobotanists were consulted. In America, to use a vernacular expression, "one simply wouldn't get away with it."

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LETTERS TO THE EDITOR

In my article, "Plants of the Bible, A Stamp Collection," I stated that I knew of no stamps picturing frankincense or myrrh. Since then Somalia in east Africa, south of the Holy Land, has issued a series of stamps honoring its incense trade. Two of these picture an actual incense tree, *Boswellia carteri,* one of three species from which frankincense is obtained. They and a third stamp, showing the burning of incense, have been added to my collection in mint form.

I should also mention that the stamp portraying apricots, the biblical "apples of gold," is Hungarian rather than Jugoslavian. I noticed the mistake only very recently.

It is quite natural, I suppose, for anyone who gets into print to look forward to possible replies to an article. They indicate interest. The first response to this particular article came promptly. It was from a classmate of mine in the two-year botany course at the Garden. Then came a postcard from Hawaii. I had met the sender on one of The New York Botanical Garden tours, and we had exchanged addresses. She was on her way to Japan.

A most interesting communication came from the Editor of THE ASPLUNDH TREE, a quarterly published for the employees of the Asplundh Companies, tree experts. It began with a cheery "Good Morning!", then described my article as "certainly interesting!" Enclosed were three of this editor's own articles. One was on "Philatelic Trees," another on "Trees in the Bible," and the third on "State Trees of the United States."

The response that surprised me most was the letter from Hungary which you forwarded, all covered as it was with beautiful Hungarian stamps, and enclosing a few. I had no idea THE GARDEN JOURNAL had so widespread a circulation. Perhaps a few quotations from the letter will interest you. "I red your article in the July-August number of THE GARDEN JOURNAL of this year about 'Plants of the Bible.' It was really very interesting . . . . I am a gardener from profession and I am collecting plant and flower stamps, and air mail stamps. Really you have done a most scientific work not only a simple stamp collection. I thought I will try and wright you wheather you need any Hungarian flower stamps." Her offer of Hungarian stamps delighted me. It is relatively easy for me to obtain particular unused stamps of any of the recent issues, but I like, whenever possible, to get used stamps as well, and that I do not find so easy. There is a kind of "romance of use" that appeals to me. I hope she will be able to satisfy that desire to some degree.

Each day's mail, as it is pushed through the door slot, holds a potential thrill. Maybe, just maybe, there will be a letter bearing stamps of Africa, Asia, Australia, any place.

ELISE LUDLAM BOWLES
Yonkers, New York

I am a fern hobbyist and grow many of the ferns you mention. I read your article with interest. It was most informative, especially about sterilization and planting spores. Now please tell me where I might obtain either living plants or spores of the following . . . .

DR. W. C. DRUMMOND
Los Angeles, California

Watch the May-June issue of The Garden Journal

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●

A special insert in the May-June 1960 issue will describe the bulbs from Holland, for fall 1960 planting, that will be offered only to members of The New York Botanical Garden. An order blank and shipping label will be included in the insert.

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We believe a body of "where-to-buy" information in the advertising section of THE GARDEN JOURNAL is a distinct advantage to you, our readers. For this reason we are making an effort to convince a selected group of advertisers that THE GARDEN JOURNAL is carefully read by a devoted group of gardeners . . . gardeners who read and respond to their advertising.

As an official publication of The New York Botanical Garden, we are very sensitive to our responsibility to you. For this reason we have placed two restrictions on the acceptance of advertising in THE GARDEN JOURNAL:

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2. Claims by advertisers must be reasonable and substantiated.

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LETTERS TO THE EDITOR (from page 39)

THE GARDEN JOURNAL has long been one of the most important and interesting publications that I receive. The contents seem always to be pleasantly varied and certainly well illustrated. In the November-December 1959 issue the article about "David Fairchild's Friends" was especially interesting to me, since I lived for two years in Coral Gables, Florida, and spent many days in the Fairchild Tropical Gardens learning about tropical flora.

A picture of David Fairchild and Alex Hawkes was printed with the article by Dr. William J. Robbins . . . . Perhaps the readers of THE GARDEN JOURNAL are not familiar with the wonderful work Mr. Hawkes is doing in the field of botany. Three years ago, I met him in Coconut Grove, Florida, where he lives and raises many rare tropical plants, especially orchids, bromeliads, and aroids.

I obtained several orchid plants from Alex Hawkes which, along with the native Florida orchids I had collected in the Everglades, started my orchid collection. Now my interest in orchids is such that the many plants I have are flowing over into our living-room windows from the greenhouse. Mr. Hawkes was encouraging, patient, and helpful so I believe that a good portion of the interest I now have for these plants is due to his influence.

Mr. Hawkes is the editor of several useful publications about orchids, palms, tropical ornamentals, and bromeliads. THE ORCHID WEEKLY, which began publication in May, 1958, has proved to be the most-up-to-date source of orchid culture, history and collecting information that I've ever come across. Mr. Hawkes, in all of the papers he prints, is very precise about everything—from cultural directions to the very latest botanical nomenclature.

Since my plant hobbies now include most tropicals, especially epiphytic and semi-epiphytic plants, I have been receiving for six months THE BROMELIAD PAPERS. In this publication, Mr. Hawkes does his usual best. From his own collection of bromeliads, he has gained a wealth of knowledge which he passes on to his fortunate readers.

THE ORCHID JOURNAL, an international review of orchidology in magazine form, is also under Mr. Hawkes' editorship. This magazine is very well illustrated and contains valuable information for the orchid fancier. The "botanical" orchids seem to be a special love of Alex's, and these charming plants are often featured in THE ORCHID JOURNAL.

Mr. Hawkes is also a lecturer. Although I have never heard one of his talks, I'm sure that they must be fascinating if his writing is any indication of his verbal skill. The very fact that Mr. Hawkes has collected rare orchids and bromeliads in many central South American countries would make his plant-talk interesting.

The latest thing Alex has planned is a trip which he will conduct to Peru, Chile, Argentina, Brazil and Trinidad under the American Express Travel Service "Second Annual Jungle and Gardens Tour" plan. This thirty-day trip will start on January 19, 1960. I believe Mr. Hawkes makes at least one trip a year into the South American jungles; perhaps some of THE GARDEN JOURNAL readers might be interested in going on the next one.

I am concerned with letting other New York Botanical Garden members learn about the publications Mr. Hawkes edits, because in my experience they have been extremely useful. The address of THE ORCHID WEEKLY, THE BROMELIAD PAPERS and THE ORCHID JOURNAL is P.O. Box 435, Coconut Grove, Florida. I believe that Mr. Hawkes would send any New York Botanical Garden member a sample copy of THE ORCHID WEEKLY, if he were interested in learning more about orchids.

Let me again say how much I enjoy your fine publication, THE GARDEN JOURNAL. Please continue the wonderful work!

CHARLES MARDEN FITCH
Mamaroneck, N. Y.

The foreword to Paul Vossberg's article "On Dexter Hybrids" in the November-December issue of THE GARDEN JOURNAL is O.K.—but it doesn't tell the story fully enough.

First the Committee (Dr. Clement G. Bowers, Dr. Henry T. Skinner, Dr. Donald Wyman, Mr. Vossberg and I) visited The New York Botanical Garden on May 24, 1950; looked over the plants that had been purchased from Dexter around May 1940; and labeled sixteen plants, beginning with the plant that we first agreed upon which we numbered One. (It bore the Garden's No. 67)

Vossberg and I returned on June 1. Most of the ones we had numbered were passè, but No. 67 was still top-notch, and we both were thrilled to see how good it still was.

I then went to Dr. Robbins and asked if I could have cuttings. He was most gracious in his immediate and enthusiastic "Yes." The Arthur Hoyt Scott Horticultural Foundation made a bargain with Mr. Vossberg to take the cuttings, grow them, and deliver potted plants in May 1951 — at a set price per plant delivered—Paul to have the right to keep some propagating stock.

Paul delivered about two hundred plants to the Foundation, including nearly all the sixteen New York numbers. Similar selections were made at Sam Everitt's, at Howard Phipp's and in later years at the two Moseley places.

We got about ten plants of No. One (N.Y.B.G. No. 67) which is now called 'Scintillation.' We have five here and two at the Tyler Arboretum, and some repropagations. I do not know how many Paul Vossberg kept, but he did have some good stock plants for cuttings.

Fourth and most important—the Garden was deluged in a flood some four or five years ago. No. 67 was washed away with other plants, and it was thought lost forever. But because Dr. Robbins allowed cuttings to be taken and because the Scott Foundation paid Vossberg to grow them, this valuable clone was not lost to the world, and posterity, which is just around the corner, can have it and enjoy it.

JOHN C. WISTER, *Director*
Arthur Hoyt Scott Horticultural Foundation
Swarthmore, Pa.

Tomorrow [September 19, 1959] we fly to New Delhi, India. We have visited the botanical gardens in Leningrad, Moscow, Sukumi and here [Tashkent, Uzbekiztan, U.S.S.R.] They had been destroyed during the war, but they are endeavoring to restore them—working on the one here for seven years. It has a good section of American trees and shrubs. They said they receive THE GARDEN JOURNAL of The New York Botanical Garden and are impressed with it.

MRS. MAURICE LENZ
Member of the Garden

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A storm sweeps down leaving in its wake a split tree, years of stately growth and beauty shattered in a few minutes. There was a time when the axe was the only solution to this problem but today it is not always fatal. Where the break is not too severe, scientific tree care, like modern surgery, has developed a technique of "suturing" that not only closes the wound but permits the tree to regain its normal strength and vigor. "Sutures" in order to be effective must be promptly and skillfully applied so that the break is sealed against infection and the trunk and large branches sway as a whole, not independently. This exacting process calls for trained technicians and precision instruments which is the reason why "Bartlett" has spent years in the research and development of techniques and materials for this important branch of shade tree care.

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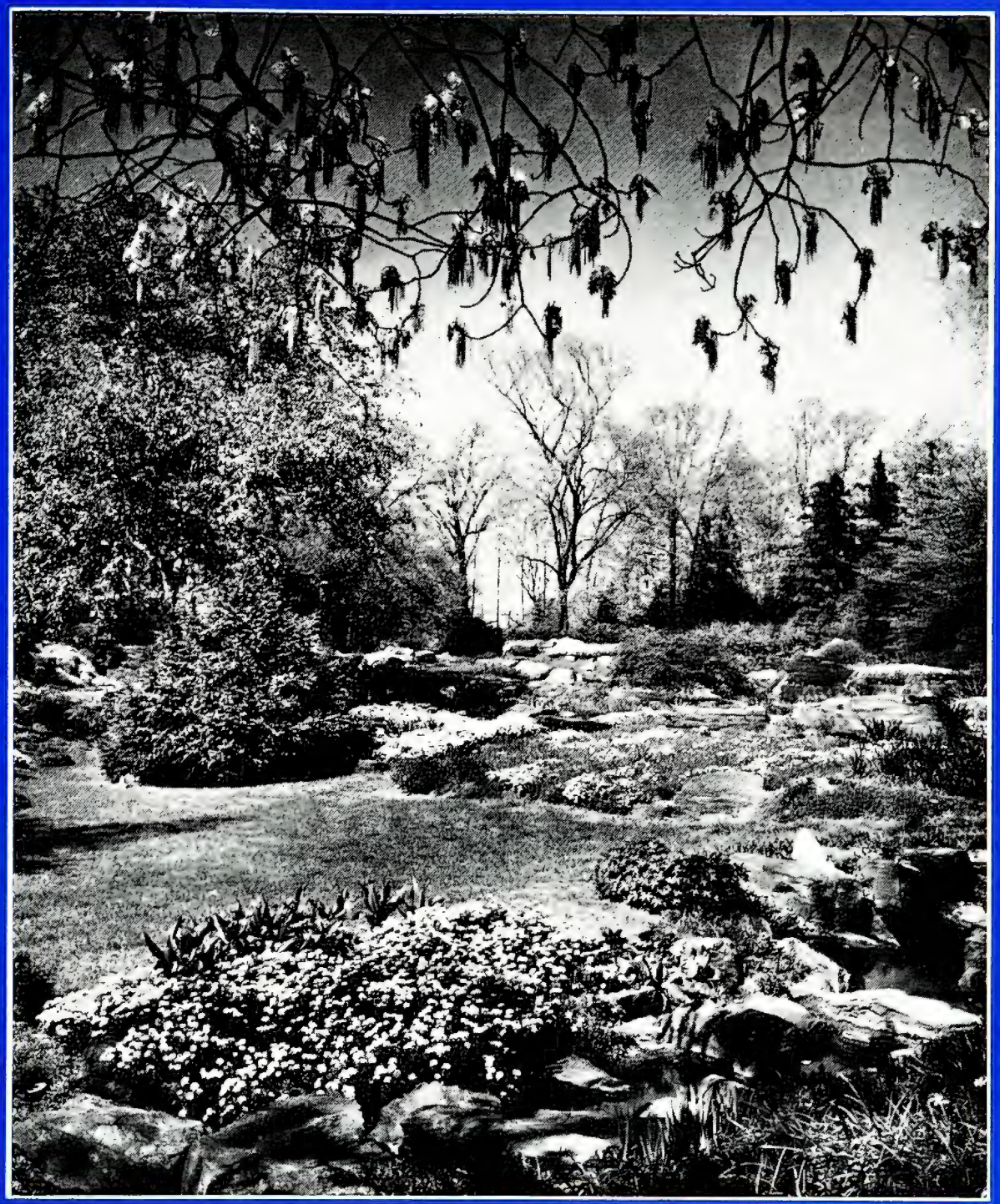

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 2 March-April, 1960

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

March 25-September 25, 1960, hours 9 a.m.-12 p.m., Floriade 1960, Rotterdam, Holland. See Page 52 this issue.

April 5-7, 1960. Landscape School, 9th District, Federated Garden Clubs of New York State, Inc., at The New York Botanical Garden.

April 8, 1960. Easter Show in the Conservatory opens to members of The New York Botanical Garden. It will continue through April 24.

April 26, 1960, 2-8 p.m., April 27, 1960, 10 a.m.-5 p.m. Fifth Annual Connecticut Daffodil Show of the American Daffodil Society at Ekman Center, Electrolux Auditorium, Old Greenwich, Connecticut. Amateur and professional gardeners from in or out of the State may enter; schedules may be obtained from Mrs. Carl N. B. Dixon, Armstrong Lane, Riverside, Connecticut.

May 3 and May 10, 1960. City Garden Clubs — annual showing of beautiful gardens in the City of New York.

May 5 and May 24, 1960. Open Garden Days at The New York Botanical Garden.

May 12, 1960. Spring Garden Tour to Princeton, New Jersey, sponsored by the Volunteer Associates of The New York Botanical Garden.

May 16, 1960. Annual Meeting of The New York Botanical Garden at the Garden.

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We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, Mrs. Donald B. Straus, for the selection of the front cover illustration—the Thompson Memorial Rock Garden at The New York Botanical Garden, photo by Gottscho-Schleisner; pp. 42, 43, Charles C. Clare, Jr.; pp. 44-47, Dr. L. K. Chambers; p. 48, upper Otis Imboden; p. 50, Oeschberg Horticultural School, Koppinger, Switzerland; p. 51, Dr. Donald P. Watson; pp. 52, 53, American Horticultural Council—Edward Gottleib Associates; p. 54, woodcut, Anita Clare; p. 55, Gottscho-Schleisner; p. 56, upper left, Walter B. Wilder, upper right, Gottscho-Schleisner; p. 57, upper left Gottscho-Schleisner; p. 58, Walter B. Wilder; p. 60 Oregon Fine Fescue Commission; p. 60, upper, Oregon Fine Fescue Commission, lower, Lawn Institute; pp. 61-64, Howard W. Swift; pp. 65, 66, Alice Dustan Kollar; p. 67, E. N. Mitchell.

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TULIPOMANIA AND THE BENEVOLENT VIRUS

By **René J. Dubos**

The following paper was presented by Dr. Dubos at the Symposium on Perspectives in Virology, New York, N. Y., February 1958. Dr. Dubos is a member of the Rockefeller Institute, which he joined in 1927, the year he received his doctorate from Rutgers University. He has had a distinguished career in all phases of bacteriology, immunology, and public health, and is specially interested in tuberculosis and disease resistance. Many honors have been conferred upon Dr. Dubos, including five Doctor of Science and one Doctor of Materia Medica degrees, and the Albert Lasker and the Trudeau awards.

THE EXISTENCE of viruses was first recognized through their ability to cause disease in man, animals, or plants —a historical accident which has conditioned all subsequent research on the effects exerted by viral infections. A few years ago, when virologists met in New York to compare notes on a group of new viruses for which no role was known in nature, the expression "Viruses in Search of a Disease" emerged naturally among them to describe the topic of the meeting. It was obviously taken for granted by all the participants in the meeting that production of disease was the earmark of a true virus. Failing the discovery of a bona fide disease in an animal or a plant, virologists try to satisfy their conviction that the raison d'être of a virus is to cause trouble by eliciting some sort of cytopathogenic effect in a tissue culture model—even, if need be, with a type of cell that the virus never has a chance to invade or even to encounter in nature. Not being a virologist, I can afford to take a more optimistic view of the problem and to entertain the fantasy that at least some viruses are now and then helpful rather than destructive to their hosts. Today, I should like to consider with you the possibility that there are circumstances in which the over-all effects of viral infection are beneficial to the community and even to the infected host.

I shall build my discussion around the history of the tulipomania, a social disorder which reached its acute phase in The Netherlands and in Flanders during the early part of the seventeenth century. As some of you may not be familiar with this peculiar mania, allow me to tell you something of its origin and manifestations.

The tulip has long been cultivated in Turkey but was unknown in Europe until the sixteenth century. It seems that the earliest European report of its existence came from Ogier Ghislin de Busbecq, who was ambassador of Ferdinand I of Austria to the court of Suleiman the Great. Busbecq saw fields of tulips in bloom for the first time while on a trip from Adrianople to Constantinople in January 1555, and he was so much impressed by the flower that he immediately arranged to procure seeds and bulbs for several of his European friends. The following April, Heinrich Herwart's garden in Augsburg was adorned with brilliant scarlet blooms. One of the first large plantations of tulips was that of Rye of Mechlen, started from Turkish bulbs around 1562. Rapidly the tulip caught the fancy of Europeans. In Holland and in Flanders its cultivation became almost a craze as well as a large matter of trade. Commercial growers and wealthy citizens competed for the production of new types of flowers characterized by attractive or unusual shapes, colors, or patterns of pigmentation. The production of a black tulip, for example, was a much desired achievement. The rivalries and tales to which it gave rise eventually found their way into Alexandre Dumas' novel, *La Tulipe Noire*.

Holland was at that time enjoying the most prosperous era of its history. An immense quantity of gold and silver was being introduced into the country by the Dutch buccaneers, who raided the Spanish and Portuguese ships homeward bound with the precious metals from the West Indies. As a form of economic war against Spain the Dutch government adopted a policy of "free" coinage, with the result that money was extremely abundant in The Netherlands. A general rise in local prices ensued which encouraged speculation among the Dutch people. The tulip with its many varieties seemed to provide good speculative material; the fact that many bulbs could be produced from a single specimen led speculators to believe that unbounded wealth could be realized by propagating the more expensive flowers. After all, this was not sillier than other forms of gambling in a non-existent commodity!

One of the earliest famous transactions was for one bulb of 'Semper Augustus', a crimson and white "flamed" tulip that was bought for thirteen thousand florins in 1609. Interest in the flower continued to grow, and in Paris around 1630 it became the rage among fashionable ladies to wear tulip blooms as corsages. The tulipomania—this most attractive boom of history—finally reached its peak in Holland between 1634 and 1637.

During the tulipomania the price of a single bulb of 'Semper Augustus' went as high as fifty-five hundred guilders. The following goods were exchanged for one bulb of 'Viceroy' tulip: four tons of wheat, eight tons of rye, four fat oxen, eight fat pigs, twelve fat sheep, two hogsheads of wine, four barrels of beer, two barrels of butter, one thousand pounds of cheese, one bed with accessories, one full dress suit, and one silver goblet. History reports that profitable mills and inns were exchanged in Flanders for a single specimen, and that a young woman became a very desirable bride when a famous bulb was made the single item of her dowry.

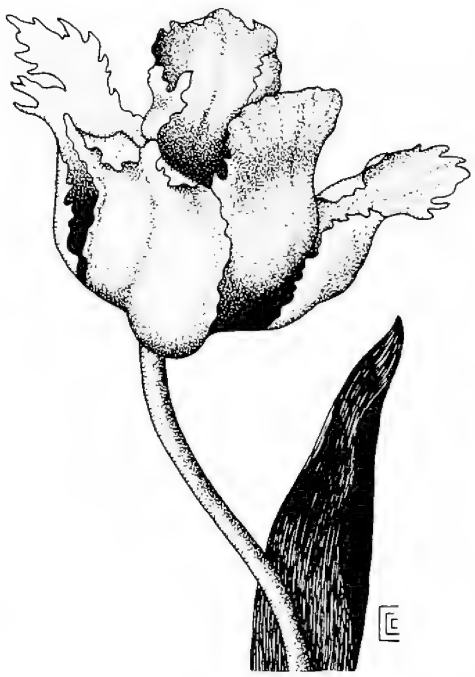
By 1637, the gambling had become so wild that the Government of the Federated States of Holland and West Frisia undertook to discourage it by ordinances rendering more difficult the enforcing of time-bargains in tulips. In 1648 moreover, the Dutch Republic discontinued "free" coinage when the Peace of Westphalia acknowledged its independence. This stopped the rise in prices and put an end to the acute febrile period of the tulipomania.[1]

1. A detailed account of tulipomania will be found in an herbal written by Abraham Muntingh, Professor of Botany and Medicine at the University of Groningen, Holland, and published in Amsterdam in 1672.

Some of the types of tulips that achieved greatest fame in history are well known from the handsome illustrations in Dutch, French, and English books of the seventeenth, eighteenth, and nineteenth centuries, as well as from paintings of the time. The younger Brueghel ("Velvet" Brueghel) was one of the foremost tulip masters and has immortalized many types of flowers in a host of pictures. Other painters also have left portraits of tulips worthy of note — for example, that painted in 1619 by Ambrosius Bosschaert and now in the Rijksmuseum in Amsterdam. The Rembrandt and Zomerschoon tulips are among the famous ancient tulips that are still cultivated today.

In addition to elegance of form and beauty of color, many of the famous tulips were characterized by distinctive patterns of pigment. These variegated forms were first carefully observed by the botanist Charles de l'Écluse of Arras, who cultivated tulips in his gardens in Vienna and in Flanders. Beginning in 1575 he described his findings in a series of accounts that were finally summarized in his book, *Rariorum Plantarum Historia*, published in 1601. Charles de l'Écluse's book, as well as many others published subsequently by Dutch, English, and French gardenists, are illustrated by handsome pictures which leave no doubt that the highest prices during the tulipomania were obtained for variegated plants. Until very recently, indeed, non-variegated flowers were rarely illustrated in books, because they were regarded as inferior and non-differentiated forms. Only during the past few years and after the development of the handsome Darwins have non-variegated flowers come to be preferred to the others because of their greater vigor and uniformity, especially for mass planting.

It was soon recognized that tulips raised from seeds do not produce variegated flowers at first. These plants (called breeders) have petals of uniform color—they are self-colored, as the expression goes—and their bulbs may continue to produce self-colored flowers for several years. Then after an unpredictable period of time there occurs a phenomenon referred to as "breaking" which results in variegation. From then on the bulbs of "broken" tulips continue to produce variegated flowers. According to van Slogteren and Ouboter[2] (1941), Dutch growers knew as early as 1637 that breaking could be produced at will by grafting self-colored tulips with variegated ones; Blagrave in England described in 1675 detailed techniques for grafting halves of bulbs to this end. It was also believed that breaking could be hastened by planting bulbs in poor soil or even



better by alternating cultivation in good and bad soil. But despite much practical knowledge, tulip breaking had remained an art and the mystery attending the phenomenon probably contributed to the captivating charm of the plant.[3]

In 1928 tulip breaking passed from horticultural lore into virus science when Cayley[4] in England and McKay[5] in America demonstrated that the change in the flowers was in reality the result of a viral infection of the mosaic type. Under natural conditions the virus is transmitted by aphids, but infection can also be achieved by experimental procedures, either by injection of plant juices or by grafting. Let it be mentioned in passing that the virus is widely distributed in wild lilies and in other plants; the tiger lily has been likened to "Typhoid Mary" in this regard. In consequence, a self-colored tulip has little chance of escaping infection in the field, even though it never comes into contact with a broken tulip. Breaking is likely to occur even when tulips are planted near apparently normal lilies, for healthy plants can carry the virus in a non-apparent form.

The viral infection can affect the color of the petals and also the leaves. Nor is breaking limited to tulip varieties containing anthocyanin pigments; it can also occur in clear whites or yellows which show then little or no change in color. The most striking manifestations of breaking, however, are changes in the distribution of anthocyanins in the epidermis of the petals, which become splashed or striped with different colors. It is held by McWhorter (1938)[6] that two antagonistic viruses are involved in tulip breaking. According to this author, one virus interferes with normal anthocyanin production and also causes a leaf mottle, whereas the other interferes with the floral color and has no effect on the leaves. Van Slogteren and Ouboter (1941)[7] believe, however, that one virus and differences in host response can account for the various manifestations of breaking.

Breaking of tulips is, therefore, now considered as the result of infection by a virus or by a combination of several viruses. In fact, the seventeenth century horticulturists and their followers had realized that all was not well with some of their most attractive broken specimens. They had observed that broken tulips were likely to be less vigorous than the self-colored plants and to produce fewer bulbs. In a number of cases indeed, death of broken tulips occurred after a few generations. It is also true, on the other hand, that some broken tulips have been in cultivation for more than three hundred and fifty

2. Slogteren, E. van and Ouboter, M. P. de Bruijn, Onderzoekingen over virusziekten in bloembolgewassen. II. Tulpen. I. Med. Landbouwhogeschool 45, Verh. 4, 1941.

3. For reviews of early literature on tulip breaking see:
Frylink, Adrian, The tulip. Part I. Its early history. The Garden Journal of The New York Botanical Garden, 1954: 4, 5-7, 15; and
McKay, M. B. and Warner, M. F., Historical sketch of tulip mosaic or breaking. The oldest known plant virus disease. The National Horticultural Magazine, July 1933: 179-216.

4. Cayley, Dorothy M., "Breaking" in tulips. Ann. Appl. Biol., 1928: 15, 529-539.

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years—for example, the Zomerschoon tulip has been known since 1620, and probably existed in Turkey before being introduced into Europe. When propagated by bulbs, a procedure which transmits the virus from generation to generation, these tulips continue indefinitely to produce broken blooms, but they exhibit no evidence of cumulative weakening effect of the infection. It is almost ironical to call a condition which has contributed to the spread of certain kinds of tulips all over the world, and has enriched the life of millions of people a disease. In some respects, broken tulips are like the frail-looking women who outlive their more robust contemporaries and inherit their wealth.

Flower breaking caused by various types of viruses has now been recognized in several plant species—the wallflower, the larkspur, the pansy, the camellia. Specimens of these flowers, which had been selected as new varieties, have turned out to derive their unusual and often desirable characteristics from viral infections. Certain other ornamental effects are also known to result from interference with the chlorophyll of the leaves by viral infection. The pale veined type of honeysuckle is probably the most recently recognized example of this type. Among the plants that became established as ornamental species because of a mosaic-type viral infection, one of the best known is *Abutilon striatum* var. *thompsonii* (also known in florist shops as flowering maple). It is easy to grow abutilon from seed and thus obtain plants free of virus, with green leaves unmottled and unstreaked. But the public favors the infected plants, because their leaves exhibit interesting patterns of variegation. Thus, abutilon owes much of its biological success (among men) to its accompanying virus. My colleague, Dr. Francis Holmes, informs me that all the specimens of the Wedgwood iris that he has observed are virus-infected. This iris—very popular in flower shops—is produced exclusively from bulbs and rarely exhibits any sign of infection except mottling of the leaves. Although flower breaking occurs in this species, it is unusual and not attractive.

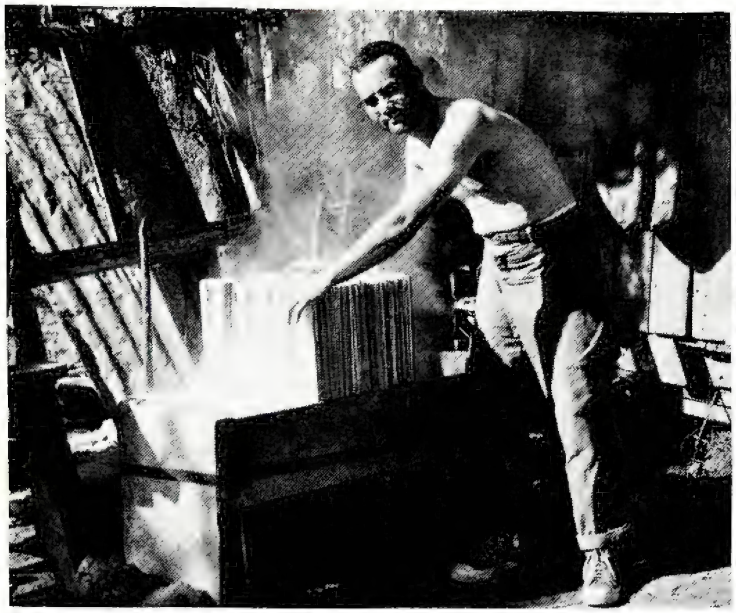
Virologists regard the broken tulips and the ornamental abutilon as diseased plants, because they are virus infected—this despite the fact that infection does not affect the survival of the plants and has increased their world distribution. In contrast, botanists and general microbiologists regard many cases of bacterial and fungal infection as manifestations of symbiosis because of beneficial effects on the plant or animal hosts. The fixation of atmospheric nitrogen in legume plants by the nodule bacteria and the enhancement of seed germination in orchids and heather by fungi constitute familiar examples. Virologists will point out, of course, that the virus of tulip breaking often decreases the size and vigor of infected plants and occasionally causes the death of some. But the same probably holds true for many other types of biological associations known to have beneficial effects. Even the nodule bacteria of legumes can become invasive and kill their hosts under certain environmental conditions. As Noel Bernard pointed out long ago, symbiosis is always at the threshold of parasitism.

Many infections are known that protect the infected individual against infection with a more virulent strain. However, it is not easy to find in the literature examples of bona fide viral infection that virologists would accept as beneficial. One might regard certain viral infections that hasten the development of flowers in pome fruit trees, prolong the life of asters, or cause carrots to produce sterile seeds the first year, as having ecological advantage for the infected plants under certain conditions. But no proof of such advantage has yet been obtained. Suggestive also is the relation of some plant viruses to their insect vectors. Infected insects live as long and breed as freely as those not infected, even though the viruses multiply extensively in their bodies. Indeed, it has been claimed, but on the basis of inadequate evidence, that leafhoppers raised on celery or aster plants infected with aster yellows virus develop faster, live longer, and produce more young than those fed on healthy plants. Similarly, aphids fed on sugar beets infected with virus seem to be more fecund than those fed on healthy plants. It is possible, of course, that these beneficial effects are indirect and merely the expression of nutritional factors rather than of the presence of the virus in the tissues of the insect. But whatever their cause, their ultimate result may constitute an ecological advantage to the infected insect.

The rickettsia-like intracellular particles in insects and the chloroplasts in *Chlorella* might be registered as examples of useful infection, since they confer advantages and yet are not essential to survival of the insect or the plant—as shown by the fact that they can be eliminated by drug treatment. But endosymbionts are called plastids and not viruses by cytologists. It might be pointed out in passing that if endosymbionts with beneficial effects are called plastids by definition, then it becomes obviously pointless to search the literature for a useful virus.

Fortunately for my theme, there exist a few types of relationships between bacteria and bacteriophage for which objective evidence is available that the presence of the virus can be of advantage to the infected host under special circumstances. For instance, the diphtheria bacillus produces toxin only when infected with the proper kind of β bacteriophage. Toxigenic strains no longer produce toxin when "cured" of their bacteriophage infection and produce it again after being reinfected. As the non-toxigenic bacilli are unable to proliferate in living tissues, it is apparent that the biological success of this bacterial species is enhanced by bacteriophage infection. The transduction by lambda phage of galactozymase to K12

(Continued on page 66)



Pressing and drying plants is difficult under wet, tropical conditions. At Cana, the meager supply of unleaded gasoline had been exhausted and rather than allow specimens to rot, the plant collectors employed a wood fire. Above left—A plant press is being placed over such a fire for drying.

Above right—The last remaining building at Cana, the former office of the Darien Gold Mining Company.

PLANT COLLECTING in the Land of Balboa

By **William L. Stern**

Dr. Stern is Curator of the Samuel James Record Memorial Collection, School of Forestry, Yale University. In June 1960, he will assume the position of Curator, Division of Woods in the Smithsonian Institution, Washington, D.C. This Division will be coordinated with the other Divisions in the Department of Botany in the Museum of Natural History, of which Dr. A. C. Smith is Director.

El Darién, the Darien, the most remote and backward of Panama's provinces. El Darién, where from a hilltop near Cuarecua, Vasco Nuñez de Balboa sighted the seventh sea, the Pacific Ocean, in 1513. Although it is the site of the earliest settlements in the New World, until recently the Darien was a land whose true character was masked by exaggerated reports and distorted by half-truths. Only a few years ago it was still thought to be a country of high mountains, whose peaks were continuously enveloped in a shroud of clouds. The native Indians were considered to be fierce and sullen. The forests were said to be impassable. Late explorations by crews of the Subcomité del Darién, surveying the route through the Darien for the Interamerican Highway, have shown these extreme tales to be largely fictitious.

The Darien country is important; it is the transitional region between the North and South American continents. Historical geology shows us that in ancient times the seas swept over what is now the Isthmus of Panama, and the Darien was the home of the fish and the alga; there was no terrestrial life, as we know it. We are quite certain that at least until the end of the Mesozoic Era the North and South American continents were united by land. At some time during the earliest part of the Cenozoic Era, perhaps in Eocene time, the connecting lands subsided, and the waters of the Caribbean Sea flowed westward into the Pacific Ocean. An effective barrier was present, that must have seriously impeded the migration of organisms between the two great land masses. It was not until late Miocene times that volcanic activity, accompanied by mountain building, uplifted the lands from beneath the seas to form what we now know as the Isthmus of Panama. Thus, for the better part of sixty million years, there was no terrestrial link between North and South America.

As the isthmian lands continued to rise above the seas during the passing of the eons, plants and animals from the adjacent continents slowly moved across the newly formed land-bridge. The ground again became populated with terrestrial organisms; those from the north encountered those from the south. Some plants and animals remained on the isthmus, became established, and intermingled; others continued on.

The biologist, ever seeking to explain the intricacies of life, finds the present-day flora and fauna of the Darien of great interest. Organisms of both northern and southern affinities probably exist there; some which are peculiar to the isthmus itself are likely to have evolved in the passage of time. The Darien is thus a region of biological interchange, an area of flux. It is a bio-geographic crossroad.

The botanist viewing Darien for the first time wonders about the kinds of plants, their distribution, and their relationships. Are they largely akin to those of the Northern Hemisphere? Or is precedence taken by southern plants? Have any new species of plants, different from those of North and South America, evolved in this place of change? These were some of the questions on the minds of a group of botanical explorers when, in the spring of 1959, they first set foot at El Real, a town in Darien near the place where the waters of the two great rivers, Chucunaque and Tuira, converge on their restless

Victoriano brings in a zaino to feed the expedition.

voyage to the Golfo de San Miguel and the Pacific Ocean.

In the late summer of 1958 plans began to take shape at the Yale University School of Forestry; these were to culminate in perhaps the largest botanical expedition to the Darien. The author, leader of the expedition, is a member of the faculty of the School of Forestry; Professor Kenton L. Chambers and John E. Ebinger are in the Department of Botany. The three were Yale's representatives to El Darién, Panama. The Yale contingent, suitably inoculated against a number of tropical maladies and armed with anti-malarial drugs, was joined in Miami, Florida, by Professor John D. Dwyer of the Department of Biology at St. Louis University. Together the group arrived in Panama late in May 1959. Its objectives included a botanical survey of the Darien to be as comprehensive as time and resources would allow.

Each one had his own special field of interest. My own major concern was with woody plants and particularly the collection of wood samples for Yale's Samuel James Record Memorial Collection. Professor Chambers, keenly interested in cytotaxonomy, wanted to collect and preserve flower buds for subsequent cytological and genetic investigation. Mr. Ebinger, a graduate student, was desirous of gaining field experience in the tropics; Professor Dwyer's consuming interest was in leguminous plants. But we agreed that the object of the expedition — to find out what kinds of plants grow in Darien —was to come first.

We were fortunate in having excellent friends in Panama, facilitators, expediters, and red-tape cutters all. In these respects, John Brown of the Servicio Interamericano de Cooperación Agrícola en Panamá and Barney Forgeson of the Naval Research Laboratory (Canal Zone Corrosion Laboratory) were most helpful. However, had it not been for our close and fond association with Otis Imboden, photographer, linguist, trouble-shooter, camper par excellence, and all-round good fellow, the expedition would hardly have been successful. The U. S. Navy was kind enough to arrange for our transport by sea to Darien on the minesweeper "Falcon," and the U. S. Army ferried our equipment and provisions directly to El Real on an LCM, a landing craft able to negotiate the shallow waters of the Río Tuira. At El Real we occupied and used as a field headquarters the "office building" of

The flower of *Pereskia bleo*. This is a Darien cactus with broad leaves and tree-like aspect.

the Sub-comité del Darién, an agency of the Pan American Highway Congress in charge of extending the Interamerican Highway across the "Darien Gap" into Colombia.

El Real is a poor town. Most of the inhabitants are Negroes, Spanish-speaking descendants of the African slaves who trudged across the Darien with Peruvian gold, bound for the caravels of Spain lying at anchor in the Caribbean Sea. El Real has no regular plumbing, no sewage disposal, no healthy supply of drinking water. Only the two main streets are paved. The feeble municipal source of electricity functions for only a few hours at night. The general stores and cantinas are owned by a few comparatively wealthy Chinese. The dwellings are mostly unpainted, with walls of reeds and roofs of thatch or corrugated iron.

The major importance of El Real to the economy of Darien is its location at the confluence of the Ríos Chucunaque and Tuira; it is here in El Real that the produce of the interior of Darien is funneled to the markets of Panama. It is here that the plátanos (plantains) and bananas are loaded onto filthy coastwise motor-craft for passage to the markets of Panama City. It is here that manufactured goods and food are brought in from Panama City and unloaded for distribution by piragua to the smaller, up-river towns of Pinogana, Yapé, and Boca de Cupe. El Real is the prototype for the Darien towns — most of the others are more or less miserable in comparison.

With the help of Mr. Imboden and our guide, José Carretero, we selected three sites around which we would spend most of our time in the field: Paya, a Cuna Indian village on the Río Paya; Cana, the ancient locale of the colonial Spanish gold mines; and Campamento Buena Vista, a point on the Río Chucunaque just up-river from the confluence of the Río Tuquesa. We felt that with the relatively limited time available, we could sample the flora of these three quite different regions as well as the area around El Real.

At Paya we lived with the Cuna Indians in one of their chosas or huts. Their dwellings are walled with reeds, may be floored with split trunks of the black palm, *Astrocaryum standleyanum*, and roofed with the overlapping leaves of *Heliconia* spp. The Cunas are one of the groups of "aborigines" that in-

Quipo trees *(Cavanillesia platanifolia)* along the Río Tuira are the "trade mark" of Darien.

Boca de Cupe, perched on the banks of the Río Tuira, is subjected to flood by rapidly rising waters following an all-night rainstorm. The boats in the foreground are piraguas; the tree at left is a mango.

habit the Darien. Most of their number have been more or less "civilized" and are largely congregated on the Caribbean islands off the San Blas coast of the Isthmus of Panama. Others live along the upper Río Chucunaque and Río Bayano. These at Paya are the remnants, the poor relatives of the so-called San Blas Indians. Shy and relatively uncommunicative, the Cunas are exceedingly curious. We found them watching and discussing even our most intimate activities. Nevertheless, they were good hosts and became less shy during our stay. In contrast to the Chocó Indians who also live in Darien, the Cunas are fully clothed; the women are frequently arrayed in brightly colored blouses, molas, of intricately patterned, appliquéd cloth. Many of the women sport small gold rings in their noses and other kinds of jewelry.

At Cana we were in a remote part of a remote province, sixteen miles, as the oropéndola flies, from the closest habitation and certainly three or four times as far by our tortuous trail. Cana is located in a pleasant valley at seventeen hundred and fifty feet above sea level between Cerro Pirre and Cerro Setetule, two mountainous ridges in central Darien. The colonial Spanish had mined gold at Santa Cruz de Cana (Las Minas del Espiritu Santo) in the eighteenth century. However, because of repeated fracases with English pirates and renegade bands, coupled with the increasing difficulty of working the ever deepening mines, the Spaniards gave up their interests in Cana. Not long after, the mines were completely abandoned. Near the end of the nineteenth century interest in the Espiritu Santo mines was revived, the Darien Gold Mining Company Ltd. was formed in England, and for a time gold again flowed. Then in 1911 the Darien Gold Mining Company halted its operations and ended many decades of exploitation in the Cana area. The forest reclaimed what was originally in its domain.

At the time of the English venture a town of several thousand stood at Cana; there was plumbing, electricity, a railroad from the Río Tuira at Boca de Cupe, and other amenities of life. It is a weird sensation to walk in the forests of Cana today, to stumble over rusty railroad tracks, to see the remains of a sawmill, to step into the ramshackle dwelling once the office of the mining company and now the home of hordes of bats and wasps, to walk over crunchy, corrugated iron roofs resting on the completely disintegrated wooden house-frames, to peer into the inky dark recesses of long forgotten mine shafts, and to drink sparkling water from a pipe many scores of miles from the next nearest plumbing system.

On the Río Chucunaque we were fortunately quartered in relative comfort at the camp of the Panamerican Delhi Petrolera, a company prospecting for oil in Darien. We found ourselves

The Cunas at Paya live much as did their ancestors many hundreds of years ago. Their huts ordinarily have earthen floors, and the roofs are thatched with the folded leaves of heliconias. In contrast to the open-sided chozas of the Chocóes, Cuna huts are walled and entered through a door.

in the vicinity of several families of Chocó Indians. These Indians differ from the Cunas in many ways, including their lack of dress and the fact that they live in family groups rather than in villages. The men are entirely naked, except for a loin cloth; the women are bare-breasted, although they do wear a wrap-around type of skirt. The Chocóes, both male and female, like to adorn themselves in several ways. Their bodies are often grotesquely tinted, largely through the use of jagua *(Genipa americana)*, a small tree related to coffee. The juice of the fruit, although colorless, readily stains the skin an indelible dark blue or purple which on the Indians appears black. Lipsticks and dusting powders, obtained in the river towns, are also in vogue. But the scarlet lipsticks are used to decorate other parts of the body than the lips. Silver jewelry, in the form of enormous, many-parted earrings, bracelets, and necklaces of coins, is commonly worn by both sexes. The Chocóes are excellent river men. Standing upright in their narrow piraguas in swiftly flowing water, they create an impressive picture of litheness and skill.

Collecting plant specimens under tropical conditions is arduous at best. Our major effort was spent in gathering leafy twigs bearing flowers from the desired plants and arranging these in folded layers of newspapers, alternated with blotters and aluminum corrugates. Many such sandwiches were strapped tightly together and placed over gasoline or kerosene stoves on suitable supports in such a manner that the hot air rising from the stoves passed through the corrugates. The hot, drying air removed the moisture from the specimens adjacent to the aluminum corrugates that acted as flues. This is easier said than done. First, we always had to erect some kind of roof for our drying apparatus; second, we had to arrange for dry storage in the field of our dried plant specimens; and third, we had to maintain a supply of fuel at a great distance from our source of supply. Wood samples once cut had to be kept dry, and a shelter was needed for these also. The most troublesome problem of tropical plant collecting is to maintain dried specimens in a dry condition. The humid atmospheric conditions and frequent heavy rains are hardly conducive to this requirement. Improperly dried specimens, or dried specimens that become re-moistened, will mold rapidly and are thus rendered useless for subsequent study.

Frequently the plants in which we were interested were high trees, some in excess of one hundred feet. This meant having them felled — no mean task with some of those tough, hard-timbered tropical trees with trunks four or five feet in diameter. Often vines were of interest, and usually these were located in the tops of towering trees. Therefore in selecting men for our trips—besides boatmen, motoristas, trail cutters, camp helpers, and a cook—we had to obtain good axemen capable of handling these giant trees.

Originally, before man's agricultural abuses, Darien was probably completely covered by forest. This is still the case today over much of the province. For convenience the forests of Darien can be divided into virgin (original) and successional (that which returns after the land has been disturbed), and into riverine (along the rivers) and upland. Virgin riverine forests are still to be found in areas along the rivers that have not been employed for agriculture.

The most impressive of these forests are the pure stands of cativo *(Prioria copaifera)* and alcornoque *(Mora oleifera)*. Both are leguminous trees which bear pods that contain only a single seed. Forests of cativo and alcornoque occur on the river margins in soil which may be periodically inundated. Alcornoque occurs in the transitional zone where the sea water meets the downflowing water of the rivers. The lower branches of alcornoque nearest the water often overlap the river, forming an attractive bluish green fringe. Cativo trees are among the largest in the forest and may be well over one hundred feet tall and three to five feet in diameter at the base. The timber is useful as a general purpose wood and is commonly employed as face veneer or core stock in plywood.

Where the river margin lands have been disturbed, the virgin forest trees are temporarily excluded, and a variety of "weed" trees takes over the area. These trees persist, constantly modifying the environment, until conditions are again suitable for the virgin forest species to re-appear. The guarumo (*Cecropia* spp.) and palo santo (*Triplaris* sp.) are common, and their hollow stems serve as domatia for ants which live symbiotically with these trees.

At the slightest provocation, the ants swarm out, full of fight, and descend on any individual who has incautiously appeared in their path. It is said that the pirates of old, who used the ports of Darien as bases for their buccaneering, tied their prisoners to the trunk of the palo santo as a form of torture. The bullhorn acacias *(Myrmecodendron* or *Acacia* spp.), small leguminous

Although groundcover is often restricted in upland forests, which may be heavily shaded, ferns (lower left) may be common elements. The leaves of *Gustavia*, a member of the Brazil-nut family, can be seen in the upper center.

These young Cunas, playing their reed "pipes of Pan" at Paya, are in their middle teens.

shrubs, bear over-sized, inflated thorns which also serve as domatia for ants. Other frequently occurring trees in the successional riverine forests are guácimo *(Guazuma ulmifolia)* and balsa *(Ochroma pyramidale)*. Successional forests are often characterized by thicket-like or jungle growth covered with a topping of clambering vines.

The upland virgin forest presents an almost park-like atmosphere. Most of the undergrowth, characteristic of successional forests in general, has been shaded out. Walking is relatively easy. The forests are usually heterogeneous in composition, in contrast to the pure stands which may occur under the specialized conditions of the immediate river margin. An interesting tree of the upland forest is the amarillo de Guayaquil *(Centrolobium yavizanum)*, abundant along parts of the trail between Cana and Boca de Cupe. The fruits of this leguminous tree resemble huge, winged maple samaras with stiff spines borne on the seed containing end. Mahogany *(Swietenia macrophylla)* also occurs in the upland forests and is quite heavily exploited for lumber. The "trade mark" of Darien is assuredly the quipo *(Cavanillesia platanifolia)*. These gigantic trees occur on the uplands as well as near the river borders. They ordinarily tower above the next highest trees, and their crowns emerge from the forest canopy. Their trunks are almost cylindrical, smooth, and free of branches for sometimes one hundred feet. The base of the tree is buttressed, and the thickly folded bark at the base reminds one of the corrugated skin of an elephant. The crown is umbrella-shaped, and the branches are relatively stubby. In all, the quipo is the outstanding tree of Darien. Unfortunately, its soft, punky wood is worthless for use as timber.

Another interesting tree of Darien, especially on the slopes above the Río Chucunaque, is the bálsamo *(Myroxylon balsamum)*. The bark of the bálsamo is the source of the drug, balsam-of-Peru. The characteristic aroma of bálsamo bark is produced only when wounding induces the flow and subsequent oxidation of the sap to form the dark reddish brown, highly aromatic balsam. The wood is very tough and hard, purple and highly lustrous. It finds limited commercial uses for novelties and objects of turnery. Other trees of importance are the cocos *(Lecythis* spp.), relatives of the Brazil-nut tree, which bear coconut-sized, woody fruits; sangre *(Pterocarpus* sp.), a legume with blood-red sap; and bonga *(Ceiba* sp.), a huge, spreading tree with very heavy major limbs that dominate the wide-spreading crown. Nune *(Hura crepitans)* is a spiny-barked tree of the poinsettia family, whose milky white sap is reputedly a dermatotoxin.

Much of our travel was by means of the rivers, the highways of Darien. The craft were large native piraguas, boats especially suitable for travel on rapidly flowing streams. The piragua is constructed of a single, hollowed-out tree trunk—frequently espavé *(Anacardium excelsum)*, cedro espino *(Bombacopsis quinata)*, or cedro *(Cedrela* sp.). Its

A group of Chocó Indian men stand before their stilted chosa. The lance-shaped paddles are characteristic of those used throughout Darien.

bottom and sides are thick and capable of withstanding the pounding of rocks when "shooting" rapids. Piraguas can be poled, paddled, or, as is commonly the case these days, equipped with powerful outboard motors. We employed two piraguas, one powered by an eighteen-horsepower motor, the other by a thirty-five–horsepower motor. These strong engines were especially necessary when pushing our heavily laden boats against the swift, downstream current.

Although we employed riverine roads to a large extent, our four-day trip into Cana was on foot from the Tuira town of Boca de Cupe. Our supplies and equipment were lashed to five bedraggled, beaten beasts—and we had little hope of their reaching Cana. After the first few rugged miles, however, we changed our opinions. These poor horses outdistanced us over the muddy, rain-soaked trails and except for some rather ugly, friction-induced sores on their backs, made the round trip in better shape than we did.

Much of the time in the field was spent en campamento. We slept in jungle hammocks which if slung properly, and with a little luck, are the ideal way to spend nights in the tropical forest off the verminous ground, screened from winged varmints, and protected (more or less) from the rain.

Cooking, of course, was done over an open wood fire. "Changu," our cook, was very adept at manipulating the intensity of the fire. The fire was set with five or six logs arranged in a spoke-like manner. By moving these "spokes" into or away from the "hub," more or less heat could be produced at the center of the fire. Pure water was a problem, especially near habitations where some of the populace were almost certainly infected with intestinal amoebae or bacteria. To combat this threat, all drinking water was treated with "Halazone" tablets which release chlorine into the water and render it potable; bad-tasting, but safe.

Food consisted mainly of rice, the staple in Darien, which we supplemented with a variety of tinned soups, tuna fish, coffee, crackers, mixed vegetables, corned beef, fresh onions, condiments, and whatever game our hunter, Victoriano, could produce. It was surprising to us that with our fairly well-balanced supply of foodstuffs, "Changu" would conveniently "forget" to prepare soups or hot chocolate, or to serve fruit juices. It was evident that our men preferred rice to everything else, and so we were fed mostly on rice until we insisted on other foods. A quantity of canned "soda pop" and alcoholic beverages rounded out the liquid refreshments and served to relieve the tedium of drinking "Halazone"-treated water. Whiskey was a very pleasing and stimulating toddy after a sun-up to sun-down tramp, largely in the driving rain.

There were times, especially on our trip to Cana, when we were quite low on "regular" food. Victoriano had poor luck hunting, and we were reduced to eating whatever was brought to our table. The pavo, or turkey, is a black, arboreal fowl; but only in being a fowl does it resemble what I know as a turkey. When well stewed and seasoned, it makes a respectable repast. The toucán has always been a bird which I associated with the flight cage in the zoo. However, these snout-heavy birds, I learned, are also edible if this term is used in its broadest sense. The culmination of our avian fare was a parrot, guaca, a most gorgeously attired bird—but the meat of the parrot is as tough as his raucous, strident call indicates. We lived much better when some of the mammalian game was brought in. A zaino or wild pig proved to have delectable meat, smoked and eaten as ham; the tender flesh of the venado, a kind of deer, was a welcome change, even though we ate it for three consecutive meals to keep it from spoiling. The ñeque, a large rodent, is also savored by the hungry. Game is really quite abundant in the more remote areas, and if one is not too fastidious, or is very hungry, he can live rather well.

Every trip has its exciting moments, those we would care not to, or to, live over again as the case may be. For me, the most impressive experience took place immediately on our return from Cana to Boca de Cupe. After a forced hike we arrived, mud-covered, sweat-soaked, and weary-worn, late in the afternoon at Boca de Cupe above the banks of the Río Tuira. Our plan was immediately to load our piraguas and head downstream in the gathering dusk to El Real. Our motorista, "Nandu," was well acquainted with the river, and we had no fears of traveling in the dark. However, as we got under way, a rainstorm overtook us and proved so heavy that we thought it best to return to Boca de Cupe to spend the night. After a great deal of difficulty, our piraguas were turned about in the racing river and tied up at Boca de Cupe. Grabbing whatever personal gear was at hand, we scrambled up the ladder that led from the river to the bank on which the town was situated. There we headed for the schoolhouse which had served as our "hotel" on another occasion. We wrung out our thoroughly soaked clothes, put on whatever dry clothes we had salvaged from the piraguas, inflated our air mattresses, and prepared to make ourselves comfortable on the floor of the schoolroom. After moving my pallet from beneath one leak in the roof to another, I finally found a dry spot and fell into a deep, soundless slumber brought on by the strenuous activities of the day. It rained all night; the corrugated metal roof resounding mightily to the impact of the hundreds of thousands of rain drops —but we slept.

Morning rose gray, and the rain had stopped. From my mattress I gazed out the open door and was startled to see the river parallel with the bank upon which the town was perched. Only last night, I recollected, we had climbed fifteen feet from where our piraguas were tied to gain the lip of the bank. Our piraguas! Where were they? They could not have withstood the terrific onslaught of the Tuira in flood. Hundreds of specimens — the results of a week of collecting at Cana — were in those boats, to say nothing of our equipment. As I drew on my trousers, I could see huge tree trunks being tossed about in the river like so many toothpicks in a teacup. Flotsam was everywhere, twirling, whirling, caught in the gigantic, muddy brown maelstrom. All the tributaries were pouring their watery burdens into the Tuira, riverside trees were undermined, huts swamped and overturned, Indians forced to flee their chosas. The river had risen fifteen feet at Boca de Cupe in just a few hours!

Walking along the bank next to the racing turmoil, Professor Chambers and I, disconsolate, sadly contemplated our loss. At least the others who were still sleeping did not yet know about it. Then, glancing downriver some distance, I thought I saw a red piragua

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THE VOID IN AMERICAN HORTICULTURAL EDUCATION AND HOW TO FILL IT

By **Donald P. Watson**

Dr. Watson is Professor of Ornamental Horticulture at Michigan State University, East Lansing, Michigan. As Chairman of the Commission on Education of the American Horticultural Council, he gave an illustrated report on his survey of horticultural education in foreign countries, at the American Horticultural Congress, Rochester, New York, in October 1959. The following paper has been developed from his report.

Appreciation of Horticulture

Renowned horticulturists in foreign countries are not necessarily products of a university. Actually, in countries that have a real appreciation of horticulture, where technical schools are quite plentiful, and practical experience is respected, university graduates in horticulture are very scarce. University graduates of all kinds are relatively few.

In many places, horticulture seems to be better understood by the man on the street than in this country; and because of this greater appreciation, a horticulturist is rated among the most highly respected of the professionals.

During my recent visit to Sydney, Australia, editorials in newspapers, talks on the radio, and conversations generally were most concerned about the fate of the trees that stand where the new opera house is going to be built. In the subway stations, "Timely hints for gardening," listing early autumn chores for the week of March 3, 1959, were sponsored by Bayer aspirin. These indicate that the interest in horticulture is strong in Australia.

The quality and variety of apples, pears, grapes, and mangoes in the average fruit stores in Auckland, New Zealand, compare favorably with those in the bon voyage shops on Madison Avenue in New York, in the City of Paris or San Francisco. These fruits are wrapped individually, handled as prized specimens, and are better than many that are exhibited at our county fairs.

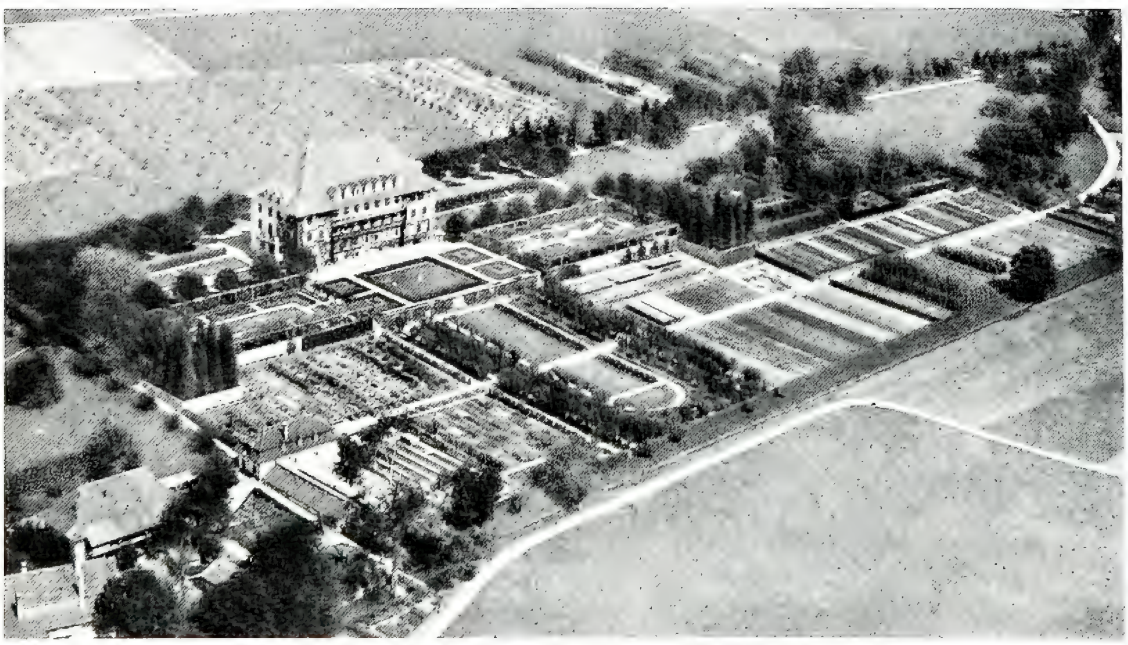
In Japan, I found flower arrangements in the cab of a truck, in a public washroom, on a bar, and on the counter of what would correspond to our hot-dog stand—good proof of public appreciation of horticulture. When I visited the agricultural director of Saita Prefecture, he proudly displayed a potted strawberry plant on his desk. It was in flower and had some small green fruits, as well as some that were expanding and beginning to turn color. It was the ultimate display of skill of his profession and the item of conversation among his professional and business associates. He went on to explain that the nursery business had been especially good this year, the year of the marriage of their prince, because the Japanese always plant a tree for a memorable occasion. This is not a gimmick to stimulate sales—it is a genuine gesture which further demonstrates the general appreciation of horticulture.

More money is spent for the maintenance of the grounds of the Government House than for any other garden in the capital of the Fiji Islands. This is a colonial necessity—it is considered the best way to impress the inhabitants with the stature of the public officials.

In Europe especially, the demand for flowers has developed shops which offer great variety for sale. Appreciation of science itself and of its direct relation to the skills of horticulture was well demonstrated at the garden display in Zürich this past summer. There the science section of the exhibits had as a slogan, "Science is in the service of the gardener."

Technical Schools

Schools of a technical and vocational nature are more numerous in most countries than they are in the United States. Burnley in Melbourne is probably one of the top schools for horticultural education in Australia. It is not large, but it offers a one and a two-year course with diploma for prac-



Ornamental gardens, greenhouses, propagation areas, and orchards are maintained by the students at Oeschberg Horticultural School, Koppinger, Switzerland. Dr. W. Meir, Director, in furnishing this picture taken several years ago, recalled his pleasant visit to The New York Botanical Garden in 1933.

At the Garden Center in the heart of the bonsai nursery area, Urawa, Japan, customers are invited for tea while contemplating their purchases.

A corner of a bonsai nursery in Urawa, Japan.

tical and scientific training, and its graduates are well respected throughout the whole British Empire. At Hawkesbury, north of Sydney, is located a fine technical agricultural college where training is offered in fruits, vegetables, and food processing, phases of horticulture which fit directly into the agricultural production of that area. The Sydney Technical College is developing an unusually good school at Ryde, west of the city. Many of the students are enrolled by their employers in specially timed late afternoon and evening courses. Sixteen thousand students in Sydney alone, a city of three million people, are being exposed in any one year to some courses in agriculture in central schools, high schools, agricultural high schools, and technical schools. Australians appear to be doing a very good job of training professional horticulturists, but as yet there is very little responsibility for this training in the hands of the universities. Many prominent horticulturists in Australia would like to develop a more advanced scientific type of training. The first step in this direction has been the recent introduction of a chair of landscape architecture at the University of Melbourne.

In Japan, state-financed technical schools are not plentiful; actually, there are fewer vocational schools of horticulture in Japan than in most foreign countries. Its system of operation is more similar to that of the United States; yet the young people have a greater natural appreciation of plants and learn much from their parents, who have been "plant" people all their lives. The Takii Seed Farm near Kyoto operates its own horticultural school, with an average enrollment of sixty students for the first year and twenty for the second year. This large company believes that this tax-deductible item, which it is operating, is one of the most valuable parts of its business. It not only trains well-rounded horticulturists, but from them the Takii Seed Farm picks specialists for plant breeding both for its own and for competitive seed businesses.

At Oeschburg, Switzerland, is located one of the best colleges of horticulture in Europe. It is a cantonal school offering a one-year course for about twenty students, followed by two extra winter semesters for twenty students who are selected on a competitive basis. It is a small personal operation. The tuition is not high, but a large fee is collected for books, trips, and other special features. The Canton of Berne has five schools of agriculture, one for dairying, and this one school for horticulture. Ten per cent of the income comes from the federal government and the rest from the Canton itself. One of the most obvious observations is the balance that is maintained in all horticultural disciplines. The students move in the afternoons in weekly shifts from the orchard to the vegetable garden, to the ornamental gardens, to the propagation gardens, and the greenhouses in which fruits, flowers, and vegetables are grown. Chatelaine in Geneva has a similar operation.

Built on the principle of the Danish folk high school, Sohus Horticultural School in Odense is probably the newest horticultural school in Europe. It provides no practical experience whatever and was instituted by a group of growers who expressed the need for more scientifically trained people. Fifty per cent of the money for its construction was provided by these growers at an interest rate of four per cent: the other fifty per cent was obtained from various credit organizations. All of the crops produced at the school are sold on the wholesale market. The growers of horticultural crops in Odense are actually in the business of education. The forty students are selected and sent to the school by the growers themselves. Each student is required to have had from four to six years apprenticeship before he is admitted. The school concentrates for one year on the scientific aspects of plant growth through formal classes and on the students' observation of practical demonstrations of these principles by the instructors.

In England, much of the technical horticultural training is provided by parks, estates, and botanical gardens. Kew Gardens, Wisley, Edinburgh Botanic Garden, and other places are very rapidly raising the scholastic requirements for admission and introducing more science into their curricula.

Universities Stress Practical Experience

Professional horticultural educators in foreign countries make no excuse for placing great emphasis on practical experience. In Australia, it is not possible to obtain a degree in agriculture without having had at least one year of practical training in a vocational high school or college. The University of Kyoto in Japan operates its own farm and all undergraduate students, before being allowed to complete horticultural training, must spend at least one year working in general agriculture, including all branches of horticulture. In Italy, students have a heritage of gardening, and there are thirteen agricultural colleges, four or five of which are located at universities. Switzerland seems to separate the practical training from the scientific training and has built unusually high quality into the offerings at Oeschburg and Chatelaine, leaving much more of the science of horticulture to the botanists at a university level. This is somewhat true in England and Denmark, although in no university could I find four-year graduates who had not been required to have much more practical experience than is required in most institutions of

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PLANS ARE REVEALED FOR U.S. EXHIBIT AT THE FLORIADE

THE U.S. Exhibit at the Floriade, the International Horticultural Exposition in Rotterdam, March 25—September 25, 1960, will be a major attraction not only for Americans but for the rest of the world. This is the first time that our government has ever participated in a horticultural exposition abroad.

Equally important is the fact that the exhibit results from cooperation between our government and its citizens. The U.S. display at Floriade, covering three and one-half acres, is sponsored jointly by the Foreign Agricultural Service, United States Department of Agriculture, and the American Horticultural Council.

Dr. Russell J. Seibert, Director of Longwood Gardens, has chaired the American Horticultural Council's U.S. Exhibit Committee which has worked for nearly a year obtaining exhibits and materials from private and commercial, professional and educational horticultural interests to present a display that will be truly representative of American horticulture. The Finance Committee, headed by Dr. Albert J. Irving, is attempting to muster urgently needed additional funds to pay for exhibition expenses incurred on this side of the Atlantic. Contributions to this endeavor are tax-deductible.

As Carl F. Wedell, Director General of the U.S. exhibit, explains: "Here is a unique opportunity for those of us who care about horticulture to demonstrate that Americans love flowers and trees just as much as do other people. We are provided with an exceptionally effective method for revealing that Americans are not a one-sided materialistic people; on the contrary, we are one of the most active and advanced nations horticulturally."

Mr. Wedell, a past president of the American Horticultural Council and former dean of the New York Agricultural and Technical Institute, is directing activities with the administrative assistance of Miss Frances Borden of Edward Gottlieb and Associates. U.S. Exhibit Committee headquarters of the American Horticultural Council are at 640 Fifth Ave., New York City.

American Highlights

An outstanding feature of the U.S. exhibit will be a Techbuilt, pre-fabricated, single-story, patio-type home, typical of middle-income American family living. The home will contain six rooms.

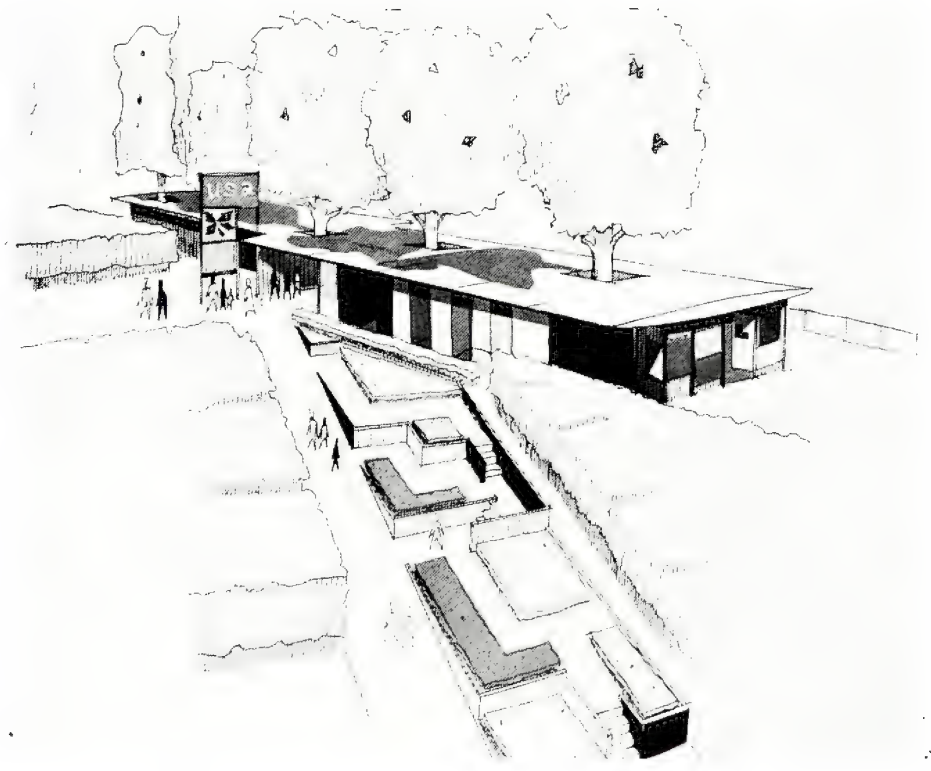
Emphasis will be on the American way of life today rather than on a way of life available in the future. The display will reveal to the world how the mass of Americans really live — the kind of home they have, their furnishings, and, above all, their garden. This family garden will be in bloom throughout the entire six months of the Floriade. Landscaping includes evergreens, azaleas, and cherry trees.

Redwood, supplied by the Simpson Timber Co. of Washington, will be featured in facings on the American home and elsewhere in the exhibit, since it is so uniquely American and consequently of exceptional interest to other nations.

Rose Gardens and Greenhouse

Because roses are among America's most popular flowers, the U.S. exhibit will include a unique display of American-bred roses assembled by All-America Rose Selections and the American Rose Society. In this five-thousand square foot area of fragrant blooms, there will be a plastic greenhouse containing tropical and subtropical plants. The Lord and Burnham greenhouse

The poster of the forthcoming International Horticultural Exposition symbolizes the theme "from seed to force." Nine nations, including the United States, will participate in the exposition which celebrates the four hundredth anniversary of the introduction of the tulip into Europe.



This is the entrance to the U. S. Exhibit at the Floriade. Trees are growing through the roof of the exhibit shelter because the Dutch in establishing the Floriade have prohibited removal or destruction of trees in the Rotterdam Park area.

Dominating the U.S. exhibit will be a typical middle-income American home with garden. The house, a pre-fabricated, single-story, patio-type, has six rooms for an average family of four.

will interest European and Asian visitors as a sample of American pre-fabricated, easily assembled greenhouses in plastic coverings.

Terraced Gardens

Leading up a slope to an exhibits pavilion will be a magnificent series of terraced gardens, with a wide variety of flowers. The changing floral parade during the six months of the Floriade will start with spring-flowering tulips, culminating in a breath-taking array of autumn chrysanthemums. Masses of the famed Burpee marigolds will be a summer highlight.

Arnold Arboretum

Close by will be an extensive display of the species and varieties of plants introduced by Harvard University's Arnold Arboretum to our own land and to others. Along the peaceful walks of the Arnold Arboretum exhibit area, high above a river, different varieties of ornamental plants will emphasize the valuable role played by America's arboretums and botanical gardens.

In other areas of the three and one-half acre park site will be exhibits by the U.S. National Arboretum, Longwood Gardens, the Morton Arboretum, and the American Association of Botanical Gardens and Arboretums. Colonial Williamsburg will be represented by a colonial formal garden.

A comprehensive library and information center will feature technical as well as popular horticultural publications. *The Garden Journal*, as well as

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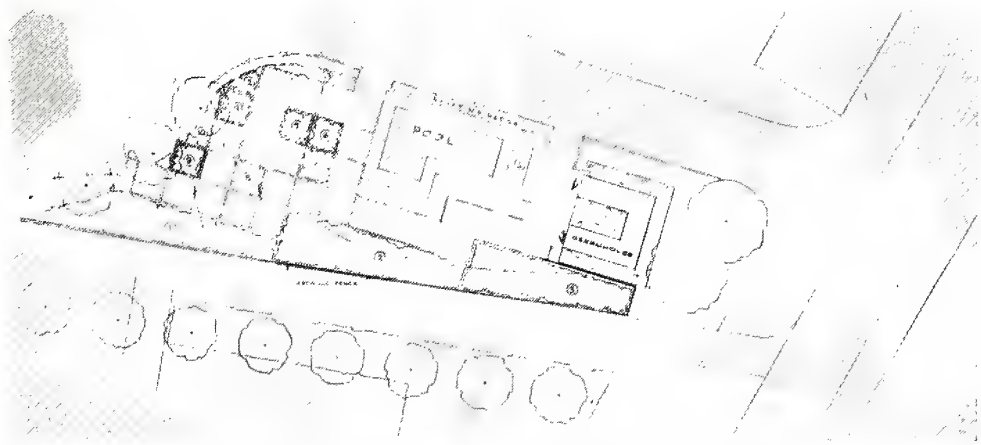
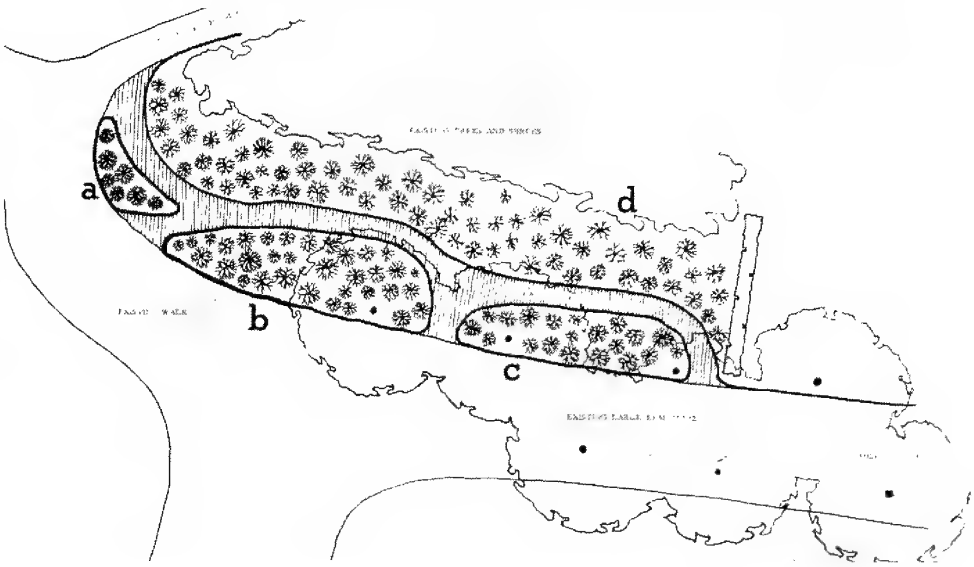


The fine display of roses to be included in the U.S. exhibit was coordinated by All-America Rose Selections and the American Rose Society. Adjacent will be a pre-fabricated plastic greenhouse including orchids and other tropical plants.

The contribution that the Arnold Arboretum, Jamaica Plain, Massachusetts, has made to American horticulture will be one of the main attractions of the U.S. exhibit. The display will feature plants introduced by the Arboretum over the last fifty years.



THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS. Charles S. Elton. 181 pages, illustrated, indexed. John Wiley & Sons, Inc., New York. 1958. $5.25.

A REVIEW

By Jack McCormick

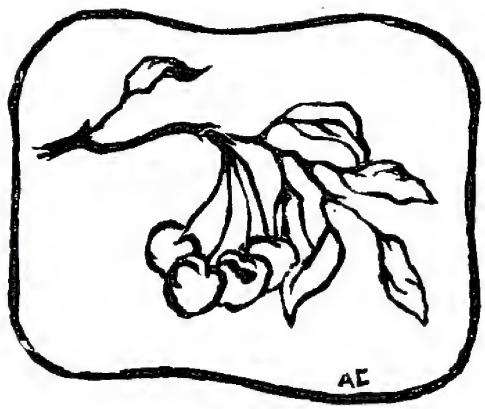
Dr. McCormick is in charge of Vegetative Studies at the American Museum of Natural History.

THE HUMAN POPULATION of our earth is not only growing larger, but human beings are also becoming more demanding of foods, raw materials, and space. Because of these circumstances, man is pressing harder than ever before into formerly unexploited or slightly exploited areas. Each time his exploitations spread or intensify, there are new disturbances in the organization of natural communities. Invasions of areas by foreign species of plants and animals and their parasites rank high among the forms of disturbance. The histories of many such invasions are considered in this book, and from them are drawn general inferences to the mechanisms and results of invasions and also to the balances that exist within and between communities as a whole.

Some conception of the importance of this book and of its fascination for the reader can be obtained from Dr. Elton's statement that our generation has a ringside seat for one of the great convulsions in the history of the world's fauna and flora. He points out that many species are able to achieve a world-wide distribution without human aid because they possess exceptionally efficient means of dispersal or are not held back by the various natural barriers that check the spread of other organisms. Examples of these are the arctic tern, golden plover, barn owl, reed grass (*Phragmites*), countless microscopic forms, and others. Many plants and animals, however, do not possess dispersal mechanisms sufficient to allow them naturally to colonize suitable areas in all parts of the world. These species are restricted to certain regions and have led to the recognition of modern floristic and faunistic realms within each of which there are rather closely related forms that do not occur in other realms. As man purposely or unintentionally disseminates these restricted forms throughout the world, he is contributing to a fantastically rapid dissolution of the biotic realms. To quote Dr. Elton, "If we look far enough ahead, the eventual state of the biological world will become not more complex but simpler—and poorer. Instead of six continental realms of life . . . there will be only one world, with the remaining wild species dispersed up to the limits set by their genetic characteristics, not to the narrower limits set by mechanical barriers as well."

Simple communities are very unstable and are subject to strong oscillations of population and even to local extinction of species. Oceanic islands are representative of such simple communities and have been found to be extremely vulnerable to invasions by foreign species and, subsequently, to frequent outbreaks of population. And it is common knowledge that cultivated areas — habitats that have been modified and greatly simplified by man—are the most frequent sites of invasions and outbreaks. On the other hand, in a stable natural community, as a forest, population outbreaks are rare and are damped down to a remarkable degree. Invading species "find themselves entering a highly complex community of different populations, they will search for breeding sites and find them occupied, for food that other species are already eating, for cover that other animals are sheltering in, and they will bump into them and be bumped into —and often be bumped off."

Still, a minor number of foreign plants and animals are able to penetrate into forests and natural bodies of water. Outstanding examples of invaders of American forests are the gypsy moth, brown-tail moth, winter moth, birch-leaf miner, cottony beech scale, spruce sawfly, elm leaf beetle, and other insects, and the chestnut blight. To these could be added Japanese honeysuckle, a dangerous pest in many forested areas of eastern North America; bird cherry, *Ailanthus*, and *Paulownia*, invaders of forest edges and openings; and several other introduced woody and herbaceous species.



It has been found that the instability of simple population systems can be mitigated, at least in part, by the provision of additional protection in the form of cover. And it has also become evident that variety in a community leads to greater stability. For example, an apple orchard—which is less complex than a forest, but infinitely more complex than a cornfield—may be populated by a hundred or more species of animals. Some of these are harmful, but most are beneficial, or at least not obnoxious. Left to themselves, the animals in an orchard will achieve a balance between themselves, although the fruit produced by the orchard may not be of the quality or quantity desired. To a large extent, the difficulties experienced with wave after wave of orchard pests are due to the upsetting of the population balances by the use of poisons which not only kill the intended victims, but may also kill their enemies and many unrelated species.

To Dr. Elton, the various lines of evidence suggest that we must re-orient our concepts of land exploitation and development. Rather than progressing further on the road toward single crop agriculture, uniform pastures and ranges, plantations of single tree species, and chemical panaceas for insect and weed control, we should strive for diversification of the landscape and the re-establishment of many natural population checks. In short, we should "conserve variety." Dr. Elton considers that "we are faced with the life-and-death need not just to find out new technological means of suppressing this plant or that animal, but of rethinking and remodeling and rearranging much of the landscape of the world that has already been so much knocked about and modified by man; while at the same time preserving what we can of real wilderness containing rich natural communities . . . we require fundamental knowledge about the balance between populations, and the kind of habitat patterns and interspersion that

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TALL PLANTS FOR THE HERB GARDEN

By **Helen M. Fox**

Helen M. (Mrs. Mortimer J.) Fox is interested in shrubs, lilies, perennials, but especially in herbs. She is the author of several books and many articles on gardening.

THE FIRST herb garden I saw was near Tours, France, where I was spending the summer many years ago. It adjoined the dwelling of a priest and was close to the kitchen entrance. Every morning I watched the cook who came out to gather herbs. The plants were low and, as in other old-time herb gardens designed in the classical style, consisted principally of culinary herbs such as summer and winter savory, tarragon, mint, basil, and sweet marjoram.

In a notable herb garden nearby at Villandry, the beds, a combination of vegetables and herbs, were planted with regard to color of foliage and were bordered with cordon fruit trees.

Some years after my first herb book had been published, I visited Helen Webster's garden in Lexington, Massachusetts. There for the first time I saw a present-day collection of herbs set out in a naturalistic fashion. I was then growing herbs in little beds in the vegetable garden, each herb by itself. Mrs. Webster did as I was to do later—she grew a great variety of plants that could be classified as herbs. Among them were many tall plants, and all were set out in what might be described as loving confusion—but the total effect was lush and healthy.

In the herb garden of today, the planting is no longer low and even; instead, high plants rise above the others. But if there is to be some kind of pattern or order, the tall plants are best kept at the back. No matter how striking the new introductions are, the herb garden continues to be a place where soft greys predominate, where fragrance is all-pervading, and where texture is more conspicuous than color.

When one is deeply interested in any subject, information seems to come one's way, and the horizon grows wider as time passes by. Every year a few herbs that are new to me are grown in my garden, but they are not kept unless they add to the beauty of the planting.

As the search continues, I realize that almost every plant has some herbal use and many, such as peonies, hollyhocks, and columbines, formerly not considered in this category, are now included. No longer dependent on herbs for drugs, we use them as teas, for flavor, for fragrance in sachets and potpourris, and to ameliorate slight disabilities and indispositions.

This year for the first time I grew the castor-oil plant, *Ricinus communis*, also called Palma Christi, from Africa. Rising as it does to eight or ten feet, with broad, deeply incised leaves measuring twenty-eight or more inches across, perhaps it is too large for the herb garden. Its tropical growth does dominate the whole scene. However, it was fun to grow for one season. Since *R. communis* is annual and not hardy, the seed was sown indoors in March. After the seed had germinated, the little plants were moved to "jiffy" pots (made of peat) and then planted outside when danger from frost was over. The plants did not grow much until August, when suddenly it was as if "Jack's beanstalk" had arrived, for the castor-oil plant grew and grew.

The flowers are monoecious with the staminate ones below the pistillate.

A path through the author's beautiful herb garden in Bedford, New York.

Black snake-root, *Cimicifuga racemosa*.

They are inconspicuous and arranged in panicles under the leaves. The beauty of the plant rests in the leaves, which look like green concave umbrellas dropped one above the other. The stems are hollow and tinted red. As each leaf dies, a circular scar remains, so in time the main stem resembles bamboo.

In addition to its well-known use as a cathartic, the oil from the fruit is valuable as a lubricant for delicate machinery. *Ricinus communis* is being grown commercially principally in Brazil and Central America; also, and oddly enough, in Oklahoma.

The leaves of *Datura stramonium*, called thorn-apple, apple-of-Peru, and Jimson-weed, yield an important drug, namely, stramonium. *D. stramonium* is a vigorous annual, much too weedy and not handsome enough for the garden. However, its relative, *D. meteloides*, which furnishes scopolamine, a drug similar to belladonna, is a handsome plant. It has a spreading habit and grows three feet high. The round green stems are soft to the touch; the leaves, tinged with plum, velvety green above and lighter on the underside, are unevenly shaped and four inches long. The erect, eight-inch long, fragrant flowers are stunning; the corollas, tubular and flaring, white marked with rose or violet, grow out of tubular green calyces having five pointed lobes. Each of the five indentations of the calyx separates near the base and persists as a cup or crown on the large bristly fruit. The only drawback to this plant where I live, is that it has a tantalizing habit of blooming so late that it is usually destroyed by frost. *Datura meteloides* was used by the rain priests of certain Indian tribes, who gave the powdered roots to patients to induce sleep and help them to see ghosts.

Lovage, *Levisticum officinale*, resembles celery in looks and taste. The leaves are compounded in threes and coarsely toothed; the inconspicuous greenish yellow flowers grow in compound umbels, typical of the parsley family to which it belongs. This tall perennial from the herb garden seems to prefer a shaded situation.

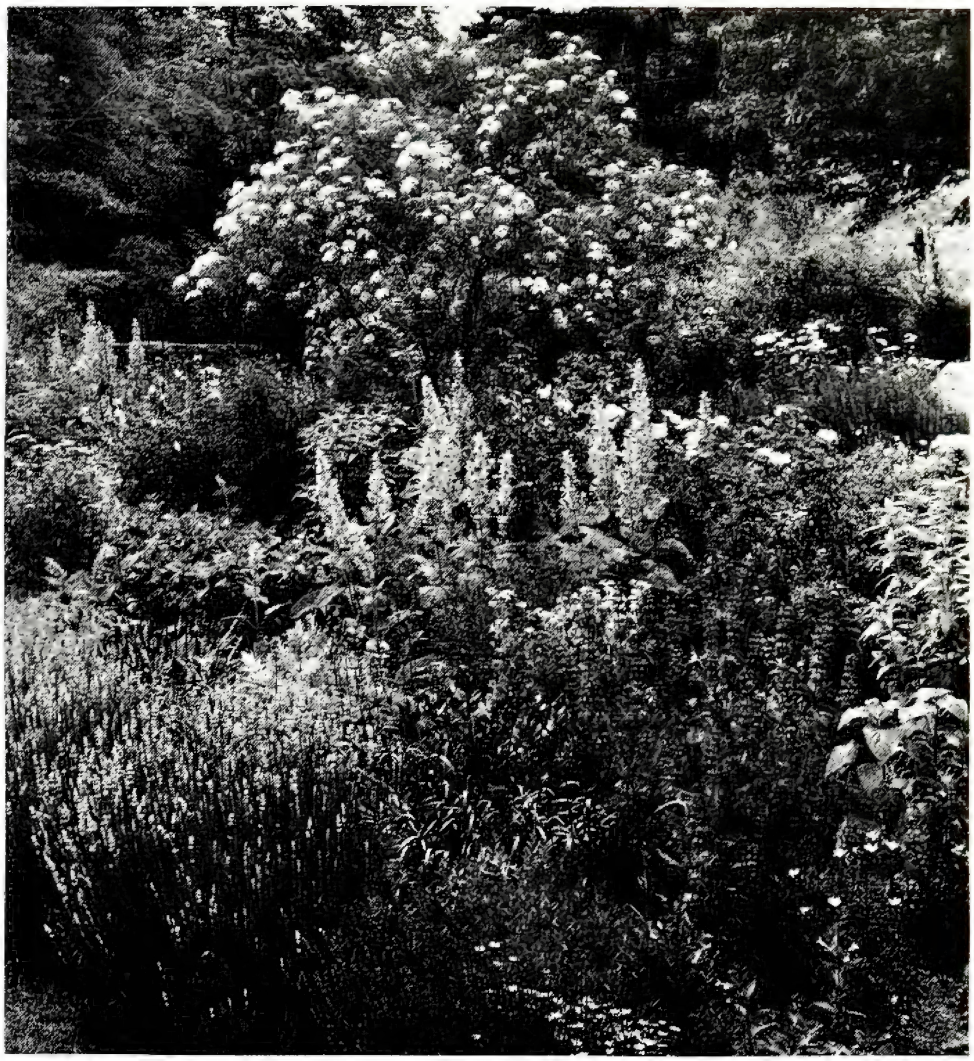
Also of the parsley family is *Angelica archangelica*, which sometimes raises its hollow, upright stems to six feet. At their bases are huge, pointed and toothed, compound leaves. At the apex of a stem is a dome-shaped umbel of tiny white flowers. If the seeds are allowed to ripen (they lose their viability very quickly), the plants die back because they are biennial; but when the flowering portion of the stem is cut off before the blossoms begin to form, the plants sometimes last for another year. The stems are candied, and the leaves provide a pleasant flavor to mild drinks, such as lemonade. To prepare them, I let the leaves soak in hot syrup and lift them out as soon as they begin to turn brown. Then I let the liquid cool and add it to the fruit juice just before serving the refreshing drink.

The cut-leaved tansy, *Tanacetum vulgare* var. *crispum*, of the Composite Family has much divided, crinkly foliage. As with other members of the genus, it carries its small, tight, yellow flowerheads in flat-topped cymes. Tansy, which has a strong odor, has been used medicinally.

Perhaps the handsomest and most fragrant plants in the herb garden are the tall lavenders, such as *Lavandula officinalis* and *L. stoechas*. Neither, alas! is hardy in my garden. However, they are so lovely with their upright spires of lavender bloom—*L. stoechas* has tufts of violet leaflets at the tips of its spires—that I winter them indoors to keep them alive. Their winter resort can be a heated garage, a sun-heated pit, or a glass-enclosed porch. *L. officinalis* can grow as much as six feet high and the same across, as it does on the rocky shores of the Mediterranean; but where I live, it, too, has to be wintered indoors.

The large, deeply incised leaves of the castor-oil plant, *Ricinus communis*, dominate the garden scene.

Beebalm, *Monarda didyma*.



Lavender borders this bed in the author's herb garden; clary sage is in flower, and elderberry blooms in the background.

A colorful biennial and member of the mustard family is *Isatis glauca*. Woad is welcome because it blooms in May — most herbs do not begin to flower until mid-June. The leaves are glaucous, as are the stems which rise to three feet or more and bear panicles of fluffy yellow bloom, followed by clusters of flat, almost black seeds. If the stems are cut back after blooming, the plants continue to flower on and off into July. This is the plant that furnished the dye used by early Britons to color themselves blue, as reported by Caesar. They prepared the leaves for dyeing by a complicated process of fermentation. Later, it was the medium for coloring cloth for the uniforms of the British navy.

Not particularly handsome but unusual looking is *Cassia marilandica*, a yellow-flowered, four-foot high perennial of the Pea Family that blooms in mid-July. It is native to eastern United States, where it is found in marshes and moist meadows; but it does so well in my garden that I have to cut it back before the seeds ripen to prevent them from invading the whole premise. The leaves are about eight inches long and three across. They are pinnately divided into from twelve to twenty leaflets, which fold inwards as soon as they are touched and remain folded after being brought indoors. The yellow pea-shaped flowers are crowded into a loose pyramid at the top of tall, erect stems. The four-inch long seed pods are flat and winged and hang gracefully from the stems. Early American doctor-botanists had hoped the plant would have the same constituents as the cassias from Africa and India that furnish cathartics, but the leaves of American senna proved to be only mildly purgative. Nevertheless, they were used as medicine by the Shakers.

In July, the herb garden is pleasantly and strongly scented by the small white panicles of garden heliotrope, *Valeriana officinalis*. The plant grows five feet high and has pinnately divided leaves. The medicine called "valerian," which comes from the roots, is used today principally to provide an agreeable flavor to sedatives. The plant is a vigorous spreader.

Most artemisias are not tall except mugwort, *Artemisia vulgaris*, which is widely used to make a moxa, a small combustible mass to burn the skin. But it is too weedy and not good-looking enough for the herb garden. A plant very similar to it is *A. lactiflora*. This, with creamy spires of bloom, is highly decorative, but it is not a herb (not mentioned in the pharmacopoeia); neither is *A. ludoviciana* var. *gnaphaloides* with very grey stalks, four to five feet high, clothed with equally grey foliage. Even though this has not flowered for me, it is attractive in the garden.

The mulleins, *Verbascum thapsus* and others, are European and Asiatic weeds naturalized in the United States. Their leaves have been used extensively for various complaints, as they are demulcent. Many people, particularly the English, like mulleins in their flower gardens because of the six-foot high columnar stems, like exclamation points, that bear narrow spires of yellow flowers at the apices. They also like the woolly texture of the leaves. There are large basal leaves that form a rosette and smaller leaves that clasp the stems.

Other plants valued for their demulcent virtues, but this time derived

from the roots, is hollyhock, *Althea rosea*, from China and marsh-mallow, *A. officinalis*. The latter, which originally came from Europe, embellishes our swamps with its huge rose, white, or red, cup-shaped flowers. When the hollyhock is permitted to rise to eight feet or more, it is too high and thin to be grown with other herbs; but if the main stalk is cut back when it reaches two feet, side branches will form, and the plant will develop a colorful, bushy growth.

Besides hollyhocks other handsome herbs come from the flower garden; among them is the foxglove, *Digitalis purpurea,* a biennial. The entire plant is softly hairy, and it demands a well-drained, somewhat shaded situation. If allowed to self-sow, *D. purpurea* will spread freely. The first year it produces only basal leaves. During the second summer, the stems will rise to four feet and bear nodding, two-lipped flowers on one side of the upper portion of the stem. If the central stem is cut back after it has finished blooming, new flowering stalks will grow out from the base and extend the bloom through most of the summer. These secondary bloomers, however, are not as striking as the first pyramid. Though called *purpurea*, there are color variations in pink, cream, and darker shades. One variety, 'Isabellina', has pale yellow flowers.

The drug, digitalis, processed from the dried leaves of *D. purpurea* is a well-known heart stimulant which has been administered since earliest times.

Helenium autumnale is a tall, native American perennial; it is known as sneezewort, wild sunflower, and false sunflower. Its rough, branching stems bear ternate, lanceolate, toothed leaves and terminal heads of yellow daisy-like flowers. As might be expected from its popular name, it is a strong irritant to the mucous membranes and causes sneezing. In the garden, the plants grow sometimes to six feet high; they bloom late in summer.

It is thought the name aconite was derived from the Black Sea port Aconis, while *napellus*, meaning "little turnip," describes the thickened tuberous roots, the portions used medicinally, of *Aconitum napellus*. The leaves of this aconite are palmate. The four-foot high stem bears spires of blue and violet flowers, which are the last to appear in the garden and furnish a dark accompaniment to the grey leaves of the herbs.

It was the Chinese who long ago first used aconites medicinally, as did certain hill tribes of India. The drug was introduced into Europe at Vienna in 1763; its function is to quiet overactivity of the heart.

Often, when I walk along country roads, across fields, or through woods and recognize medicinal plants, I wonder how their virtues first came to be known. Did man learn from watching the animals, or did he gain knowledge by trial and error? Maybe there was a little of both. Many herbs, such as chicory, *Cichorium intybus*, have a bitter taste. It is thought that in early days this characteristic might have been considered indicative of medicinal virtues. In *C. intybus*, the medicinal value is slight — the dispensatory says the roots are used as a mild tonic. But they provide a black and bitter drink popular in France, where it is often mixed with coffee — a drink which I happen to like, though it is regarded disdainfully by most Americans.

American senna, *Cassia marilandica.*

The roots of chicory are also dug up and planted in coldframes, where the young shoots are bleached to produce endive. Most of our edible endive comes from Belgium.

According to my experience, chicory is biennial, but some authorities say it is perennial. A native of Europe, it has spread along roadsides and meadows here. The stem grows to six feet high; the leaves are puckered along the central vein and indented on the margins. The flowers, which close at noon, form a head of strap-shaped florets usually light blue; sometimes, as in the northern part of the state, they are a deep blue. There are also white and pink variants.

In July the deep woods near where I live are lightened by tall white spires, composed of little flowers atop stems that rise eight feet high. These are the spires of *Cimicifuga racemosa*, commonly called black snake-root or black cohosh. The white spires look ghostly amid the dark green of the woods and have a disagreeable odor. The leaves are three-divided and incised. The rhizome-like roots furnish a bitter tonic and other medicinal concoctions.

For years I have bought woodland plants for shaded portions of my garden from E. C. Robbins of North Carolina, who has written me that I am his "longest" customer — tactfully, he did not say "oldest." In his catalog, I found *Aralia racemosa,* American spikenard, also called life-of-man and Pettymorrel. The spikenard is perennial, grows to six feet high, and has large three-divided leaves. The umbels of small white flowers form a terminal panicle and are followed by brown-purple, berry-like fruits of a pleasant aromatic flavor. The root and green of this plant are ingredients of root-beer. Fernald and Kinsey in their book, *Edible Wild Plants*, quote Dr. Huron H. Smith as writing that the Menominee Indians cooked the roots with wild onions, gooseberries, and sugar, and the result was very good. Jelly has also been made from the fruits.

In Mr. Robbins' catalog, I also found *Collinsia canadensis*, called horse-balm, horse-weed, and stone-root. This is a deliciously fragrant, five-foot high perennial of the Mint Family. It has large, coarsely toothed leaves and spreading panicles closely covered with yellow flowers, redolent of lemon. The dispensatory says the odor is strong and disagreeable, a slight difference of opinion, and that the plant was a folk remedy. I planted collinsia in the woods, and the deer ate every bit of it right down to the ground.

In late summer, the fields in parts of the United States turn into a riotously colored flower garden. There are meadows filled with milkweeds in orange,

(Continued on page 73)

This lawn has been developed from a mixture of quality grasses based upon an improved red fescue.

QUALITY LAWN SEED

By **Robert W. Schery**

Dr. Schery is Director of the Lawn Institute, Marysville, Ohio.

THESE THREE unsophisticated, familiar words, "Quality Lawn Seed" would at first glance seem simple to define, be a subject quickly disposed of. But "quality" is not a simple have or have-not state, for there are several aspects to quality. Consider that:

Quality (in lawn seed) reflects (1) the mechanical attributes of seed cleanliness, such as freedom from weeds, from chaff, from other seeds or impurities, and from breakage or cracked seeds which might deteriorate; (2) biological considerations, such as the genetic make-up of the seed, its viability or ability to germinate, abundance of food reserves, and physiological balance to yield a vigorous seedling; and (3) decisions of human beings, such as whether proper grasses are chosen for living together well in the lawn, whether the species chosen are suited to the climate and for the use to which they will be put, and whether the lawnsman will plant and care for the grass adequately. Then there is an added semantic complication. Any seed used to make a lawn is a "lawn seed," although usually grass seeds are chosen. Whether a given grass be acceptable for a lawn depends again upon human whim, and upon climate, soil, and care. Indeed, quality in lawn seed is not so uncomplicated, as it might first seem!

Fortunately, procedures and ethics of the trade, laws regulating seed commerce, and responsibility felt for well-known brands, simplify the task of determining what is quality lawn seed. For reasonable assurance a consumer need know only the few grasses that are the proven performers for his climate and conditions. He then can look to the ingredient listing required on the box or sack, to see if the star performers constitute most (if not all) of the mixture. North from Tennessee these are especially the Kentucky bluegrasses and the Oregon red fescue varieties (Chewings, Illahee, Pennlawn, Rainier); in the South, Bermuda is the chief permanent grass seeded (there is much vegetative planting of lawns in the South, i.e., sprigging and plugging for grass starts; or temporary winter seedings of ryegrass).

Along with the required composition listing on the seed box are figures for germination percentage, weed content, for "crop" (other non-weed seed), and so forth. Conventional trade standards and the seed laws pretty well assure that these meet consumer needs. Of course, top mixtures will probably be cleaned up to a higher "purity" (less chaff and extraneous seeds) than lesser stuff, and thus represent a superior value. The cleaner the seed (that is, the higher the purity) the more likely it is to contain plump, heavy seeds which are fast, vigorous sprouters.

No one will intentionally plant weeds in his lawn, and no reliable seedhouse allows consequential amounts in its lawn seed. Weed seed inadvertently harvested along with the grass is mostly eliminated by the intricate series of blowings, screenings, and separation procedures to which seed is normally subjected. Only very small weed percentages are permissible in seed marketed through regular trade channels, and in most states species especially harmful (noxious) are not allowed at all. Lawn seed procured through reliable sources is so nearly weed-free that there is no danger of a weed problem in lawns. However, dormant weed

Mature seedheads of well-tended lawn fescues have been cut, bound, and left to cure for a few days in this Oregon field.

seeds do infest almost all soils and are a frequent cause why weeds are blamed on the sown seed. The infinitesimal traces of weed seeds which might get through to the retail mixture are, moreover, mostly agricultural species which die out in a mowed lawn.

Biological factors bearing on lawn mixtures are much more involved than is the clear-cut achievement of good mechanical quality, and subject to varying opinion. Agriculturists have traditionally bred crop varieties for genetic purity, so that all plants are identical, become harvestable at the same time, and have like handling and keeping qualities. This rigid uniformity is not needed in a lawn, where the goal is simply green leafage, and the mower becomes the great guardian enforcing uniform appearance. Indeed, a number of experts believe that species with less uniform, mixed heredity are best suited for colonizing the diverse sub-environments found in any lawn (for example, sun-shade, dry-wet, fertilized-unfertilized, close-high clipped). This is one good argument for choosing natural Kentucky bluegrass (harvested from fields having many "strains," which have been in existence and subject to natural selection, some since Colonial times). It is also the reason why skillful seedsmen blend species or varieties into seed mixtures, as by adding one or more of the Oregon fescue varieties to bluegrass; there are then even more candidate grass types to satisfy the myriad of micro-climates a lawn possesses, or differing schemes of lawn care may impose.

Of course, a seedsman could go too far—by mixing in coarse haygrasses which will eventually become unsightly, or by including stifling quantities of impermanent "quick-show" species such as ryegrass and redtop. It is at this point that the consumer must protect himself, by checking the ingredient listing on the seed package. In ordinary usage a mixture should contain at least eighty per cent fine-textured, perennial grasses for the climate in which grown —such as the bluegrasses and lawn fescues mentioned for northern regions.

There are many subtle biological influences still little studied for lawn grasses. For example, what influence may seed treatment have upon the mature plant, and how does a plant's physiological state affect what is commonly diagnosed as disease? We do know from experience that certain species get along well together in the lawn. Red fescues and bluegrasses have the same general growth habit, can survive shoulder-to-shoulder in the lawn, even though their fertility and shade tolerances may differ slightly. Introduce bentgrass, however, and other lawn grasses do not survive in the patches colonized by the bent. Is this due to "smothering," an antibiotic influence, merely because bent grows on the more acid and wet soils not so suitable to other species, or what? Good blends from experienced seedsmen take these known effects into consideration, even if the causes are still obscure.

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Bluegrass panicle and dissected spikelets at left; mature bluegrass seeds resulting from maturation of spikelets in center; coarse rye-grass seeds at right for comparison of size, indicating that there are fewer "potential plants" in a pound of rye-grass than in a pound of bluegrass blend.

VIZCAYA—

An Italian Palazzo in Miami

By **Howard W. Swift**

Mr. Swift is Assistant Curator of Education at The New York Botanical Garden.

The residence, now the Dade County Art Museum, houses a vast store of European art treasures.

IN GREAT CONTRAST to homes and gardens in compact, modern design — functional, keyed to efficient and unhampered activity—here is Vizcaya.

From the hurried, tense atmosphere of crowded streets in the business section of Miami, it is a pleasant drive through tree-shaded avenues to the home of the late James Deering, which is now the Dade County Art Museum. Even its name Vizcaya (after Spain's Province of Biscay) has a rather romantic connotation.

The gates, in keeping with the estate, are constructed of wrought-iron in elaborate Italian design and mounted with a crest combining an old Spanish ship, the "Caraval Vizcaya," two sea horses, and fronds of palms. In the supporting structure, the native limestone is first noted. This stone has been used for buildings and for many of the garden features at Vizcaya. It is very porous and in this moist, subtropical climate soon becomes weathered and quite aged in appearance.

Once inside the gates, we may choose either a shady woodland path or a winding drive to the palace. The crowded growth of native trees, shrubs, and vines allows only glints of bright sunshine to penetrate. The thick foliage may still be dripping after a quick shower, causing heavier leaves to rustle rather than float to the ground. The occasional sharp voice of a bird may be startling when suddenly heard from the high branches. We can scarcely fail to sense the penetrating roots, the struggle for nourishment so typical in Florida "hammocks." All thought of the busy city is quickly dismissed.

Suddenly the sound of splashing water breaks the quietness. This sound arises from streams which slide from basin to basin in a water-course. Steps flank the water-course and descend to a small but stately courtyard at the entrance to the palace. A vivid imagination conceived this sumptuous Baroque dwelling as a permanent home to accommodate the priceless art treasures ardently collected by Mr. Deering in his extensive traveling. An imagination even more vivid conceived the sprawling formal and informal gardens which were developed out of mangrove swamps. How soon the mangrove trees would take over these gardens if the land were left uncared-for and unprotected!

At least an hour or two should be allowed to concentrate on the richness and elegance of the Museum. The splendor of period rooms eloquently reflects French, Spanish, and Italian culture. Everywhere there is work of painstaking craftsmen who have left no

Massive colonnades frame the inner patio.

Its fountain is crowned with a tiny replica of the ship "Vizcaya."

Cuban tiles and heavy accesories are in keeping with the sturdy pillars.

names behind in the archives of the great. The Oriental influence, frequently encountered in this atmosphere of old Europe, was very popular at the end of the nineteenth century.

After we have enjoyed a few first-floor rooms imbued with the tradition of other eras, it is refreshing to step outside through an arcade with bold Italian Renaissance arches and columns and then into the sun-drenched courtyard. The central feature here is a seventeenth-century Italian dolphin fountain with marble basin, above which is a lacy wrought-iron support for the little ship "Vizcaya." The pineapples, used in the ornate fountain design, are a symbol of hospitality.

Then there are upper rooms to see. These rooms for daily use are more livable, but surely not lacking in elegance—especially the bathroom! From the delightful upstairs dining room there is an excellent view of the broad formal garden, which is terminated by a small casino.

An ancient Roman sarcophagus is utilized for the basin of a central fountain.

A formal parterre garden of this extent is rare in America.

Again on the first floor, and another pause in the courtyard before we continue to the south terrace through tall gates which actually determined the height of the second floor.

Outside, the spaciousness of the rambling gardens and the bold pattern of the stone flagging are impressive. The fountain directly ahead has a Roman sarcophagus for a basin and is elaborated with lead lizards and frogs. Playing jets of water give it life.

By a short detour to the Biscayne Bay side of the Museum, we find a sheltered sea-entrance where yachts could anchor and a broad sea-scape. A very elaborate stone "barge" with sculp-

The water stairway has potted Australian-pines on either side.

Raised walks, typical of Italian gardens, provide a setting for statues and elaborate ornaments.

Left. The charming theater garden.

Right. Peacock bridge in a far corner of the grounds.

tures symbolizing delights and terrors of the sea offers protection for small craft. Slim obelisks rise from this pile of stone which is frequently pointed out to tourists who pass by on cruise boats from Bay Front Park in Miami.

Back then to the formal garden with its fanciful bedding. It is surprising that there can be so much grandeur without the use of bright color—a great parterre design, like embroidery. Few such gardens exist on this side of the Atlantic. A large raised pool, with clipped live-oaks on either side, focuses the attention. Live-oaks we generally think of as great, wide trees—like those on the higher terrace beyond—not as trees so severely trained. The raised walks left and right are typical of Italian gardens, where the natural terrain is very different from that of Miami. They pleasantly relieve the monotony of level land. These terraced walks are set apart by clipped hedges of Australian-pine (*Casuarina*) and afford a fine setting for white stone figures of gods, goddesses, and mythological creatures

Stairway leading from the casino to the Venetian boat landing.

These steps, with integrated ramp to accommodate garden carts, lead up to the casino.

wrought mostly in Italy during the seventeenth and eighteenth centuries.

A water stairway terminates the central vista. Its water falls over the edges of the pools, and at the same time energetic streams of water are thrown upward from pool to pool. On landings of the staircase, Australian-pine has again been used—this time as severely clipped trees in large jardinieres. It is interesting to find that this plant from the southern hemisphere is so widely exploited in Florida and the Caribbean Islands, both as a decorative and a naturalized plant. Through the Florida Keys it is one of the common

One of the many mythological creatures represented in stone throughout the garden.

trees, and certainly it has the appearance of belonging there.

From the raised walk along the left side of the large formal garden there are entrances to several small, secluded gardens. One is like a little theater, patterned in miniature after a garden of the Villa Gori near Sienna. It has stage wings (again of clipped Australian-pine) and was obviously not created for live performances. It is not difficult, however, to picture an eighteenth-century garden party in such a charming setting. Greens of turf and hedges, with only the brightness of gay little figures, are very refreshing. Other intimate gardens are arranged in sequence. The last is an intriguing water garden with a massive central feature, Baroque in style, that once supplied water to the town of Bassani di Sutri, near Rome. Narrow canals radiate outward and reflect colorful annual flowers.

Leaving the fountain garden, one arrives at Peacock Bridge, magnificently set off by twisted entrance columns decorated with proud peacocks. The bridge rises in a high arch and is referred to as the "O" bridge, because its reflection in the water produces a perfect oval.

Who can resist stopping to admire the high clipped hedges and the well-proportioned stairway in ascending the man-made hill where the casino is situated? The narrow ramp is made to accommodate wheeled garden trucks.

Finally, there is the casino itself. This small classical building, set as a jewel in its great garden, must have served as a pleasant retreat for quiet conversation or for tea. Its main attraction is the frescoed ceiling with a border which came from the studio of that great Venetian painter, Tiepolo.

Guests must have frequently departed from Vizcaya by the solid stone stairway which descends to the Venetian water landing, gay with brilliantly painted gondola baulks. And by this way we also take our leave.

PLANT COLLECTING (from page 49)

tied to a palm. But, how could it be? Neither Chambers nor I could believe our eyes at first; but there, safe and sound, covered with plasticos and tarpaulins lay our gear in the piraguas. All night, while we slept, our river-wise men had been awake in spells, guarding our precious cargo, bailing, shifting the "tarps," re-mooring the piraguas to protect them from the fate of others now being flung about in the river. Needless to say, we were very grateful to those Darien men for saving our collections. For this one act, we could forgive all the foolish and irritating things they might ever do.

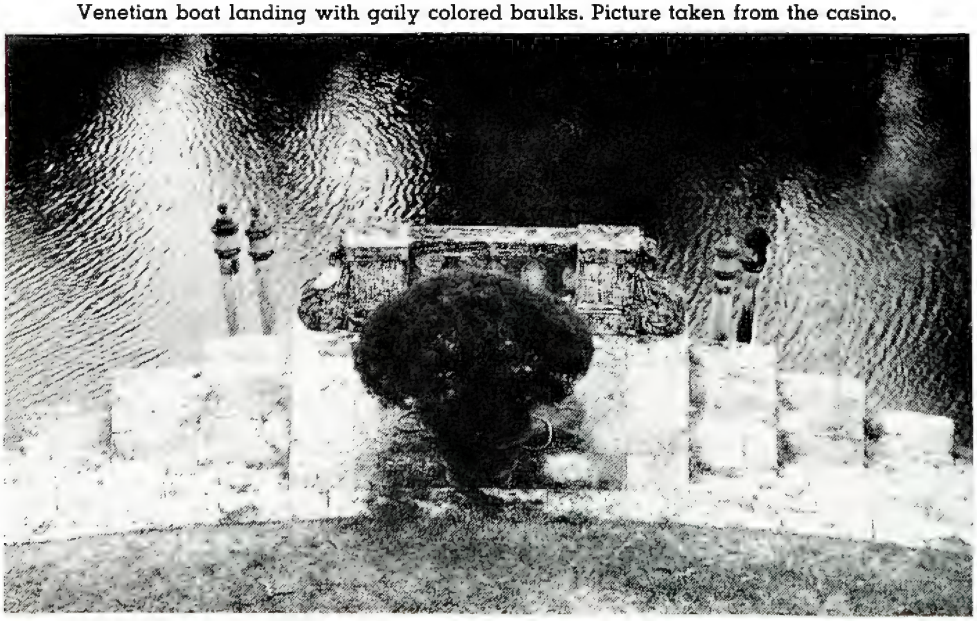
It is difficult at this writing to evaluate intelligently our collections. Certainly there will be records of plants first collected in this area; some of our material will doubtless represent species new to science; some of our material will provide more and better research material for botanists in years to come. All told we gathered over one thousand plant species from El Darién in sets of six for distribution to botanical institutions in Europe and the United States. Between six hundred and seven hundred wood specimens were collected, which will serve as the basis for research in plant anatomy. Professor Chambers obtained flower buds from one hundred and fifty plants, many from plant families heretofore unknown cytologically.

This trip is but the forerunner of others to come. Certain areas should be collected more intensively than was possible this time. The "bank above the Río Paca" deserves a long look—a deluge of rain and short supplies prevented our doing so on this trip. A different season of the year will produce new blooms and new collections. The coast of Darien near Bahia de Piñas and Ensenada Guayabo should be explored, as well as the Serrania del Sapo. Cerro Tacarcuna, near the Colombian border, is sixty-one hundred feet high; its fastnesses should be examined for new plants.

I recall one soggy evening after tramping several hours in the rain. We had eaten and dried off as best we could; our hammocks, still wet from last night's rain, had been slung. We crawled between our dampish, moldy-smelling blankets, shrank from the discomfort of them against our skin, closed our mosquito netting, and swatted at the mosquitoes that had been trapped in with us. I mumbled that any damned fool who would undergo these privations for a few miserable dried plants, some moldy wood specimens, and pickled buds, must be out of his mind or near to it. But I think I can speak for the four of us in saying we would do it all over again.

Given the opportunity, I am sure we shall.

Venetian boat landing with gaily colored baulks. Picture taken from the casino.



MEILLAND ROSE ESTABLISHMENT

By Alice Dustan Kollar

Alice Dustan (Mrs. Samuel) Kollar is garden consultant, author and lecturer. Mrs. Kollar edits the garden page of *The Newark Star-Ledger* and conducts garden workshops.

The extensive greenhouse range of the Meilland rose establishment, photographed from the balcony of Hotel Beau Site.

IT WAS OUR good fortune last summer to visit the world-famous Meilland rose establishment in its magnificent setting at Cap d'Antibes. This is a point of land jutting into the Mediterranean between Cannes and Monte Carlo. Perhaps readers of *The Garden Journal* will be interested in the accompanying pictures, as André de Vilmorin referred to the Meillands in his interesting paper, "Some French Plant Breeders and their Work in Horticulture," which was published in the January-February 1960 issue.

The beautiful wrought iron gate is open to visitors to the Meilland rose establishment.

After we had passed through the beautiful wrought iron gates at the entrance, we came upon the plantings of mimosa, the southern magnolia (*M. grandiflora*), the rubber-plant (*Ficus elastica*), palms in variety, and orange trees in fruit which surround the residence.

Beyond the Meilland family's charming home is an extensive range of greenhouses and a sparkling white stucco structure with red tile roof, so characteristic of that part of France. This proved to be the administration building of this rose-breeding establishment. Masses of white daisies and pink geraniums filled beds adjacent to it.

Just as my husband was about to ring the bell, a tall, bearded man came out with a dark-haired, little lady. We assumed her to be Mrs. Francis Meilland, widow of the renowned rose hybridizer who had passed away last year. And we were right in so assuming, as we learned when the gentleman introduced her and then gave his name, Harry Wheatcroft. (He is a member of the Wheatcroft Nursery of England, which introduces Meilland roses into that country.)

As Mrs. Meilland does not speak English, and neither her father-in-law, "Papa" Meilland, nor her son Alain were available, Mr. Wheatcroft offered to give us a quick tour. When we started, I noticed small white caps on the branch tips of several rose bushes that had been pollinated. These coverings ward off bees and other agents

that might interfere with the plant-breeding procedures.

Mr. Wheatcroft opened the door of the first greenhouse, and we had a breath-taking view of thousands of roses in many colors. Most of the Meilland roses are grown under glass in clean sand and fed by chemical culture. There are ninety thousand to one hundred thousand rose plants in the greenhouses

White caps cover the branch tips on pollinated rose bushes.

and outdoor beds, which occupy a few acres of the fabulous vacationland on the French Riviera. From these plants, about a dozen promising new cultivars are selected over a period of three years for serious consideration. This dozen, after being carefully tested and scrutinized in trial gardens in different parts of the world, is narrowed to three or four varieties. Only then do Meilland rose originations go into production elsewhere and eventually make their debut.

Four roses, originated by the late Francis Meilland, have been recently sent to American gardeners. Two of these are Floribundas, 'Sarabande' and 'Fire King', and both are All-American Rose Selections for 1960. 'Fire King' was attractively arranged in a vase in the lobby of the small hotel just across the street from the Meilland establishment. We admired the way its irridescent vermillion blooms blended with the touches of red in the otherwise cool-looking room which had white walls and dark furniture.

The two other Meilland roses being introduced are 'Golden Girl', a vigorous and shapely Grandiflora, and 'Royal Velvet'. The ruby color of the latter is stunning, its texture really velvety, and the large flowers are freely produced on a strong, tall plant. Some one counted sixty-five petals to one flower—just to give an idea of its size and fullness.

It was truly a rewarding experience to visit this place that concentrates on developing new roses, to see something of the great care and infinite patience which are part of rose hybridization, and to feel some of the pride which the Meillands justly have in their rose creations. After all, ten years elapse from the seeding of a rose to the time of its introduction as a worthy new variety.

TULIPOMANIA (from page 43)

Escherichia coli also can be of some potential ecological value, since the ability to produce the enzyme would be essential for multiplication in certain metabolic environments. Of greater practical influence is the transduction of somatic (0) antigens and probably of other virulence factors in Enterobacteriacea. It can hardly be doubted that the pathogenic behavior of these bacteria is profoundly affected by their ability to acquire new immunological characteristics as a result of infection with the proper kind of bacteriophage.

It will be noted that, in the examples of bacteria-bacteriophage relationships quoted above, the biological advantage accruing from infection could become manifest only under special environmental circumstances. This limitation probably accounts for the failure to recognize that other viruses may also

The administration building of the world-famous rose establishment.

exert beneficial effects on their host cells. In general, the techniques used by the virologist are designed to demonstrate pathogenic effects and almost by necessity therefore fail to detect beneficial relationships. The beneficial role of nodule bacteria in legumes was detected by growing these plants in soil or in media deficient in nitrogen. Legumes do not need the bacteria if soluble nitrogenous compounds are readily available, and moreover they can be killed by the infection under certain circumstances.

Since beneficial relationships become manifest only in specialized ecological situations, the proof of their existence in viral infections will require the development of new techniques and new test conditions. It will be necessary, furthermore, to introduce broader criteria for evaluating the outcome of the virus-host relationships. One of the reasons why virologists do not accept that the variegation caused by viruses constitutes a characteristic with survival value is that they regard as valid only those criteria that are measurable by laboratory operations. Esthetic and emotional reactions certainly play a role as determinants of biological success, but they have not gained a place among scientific parameters, because they cannot be readily measured. Nitrogen fixation can be measured, and for this reason infection of the sweet pea by nodule bacteria is regarded as symbiosis; if the effect of infection were merely to improve the fragrance or appearance of the flower, it would be regarded as disease.

It is true that human tastes change, but they do not always change for the better. Masses of healthy tulips, all of the same color and size and arranged in rows like soldiers, do not necessarily constitute more desirable achievements than the virus-infected specimens lovingly portrayed by the seventeenth-century painters. Pink or bronzed, the burly men and women in the health camps of political parties may not be the finest flowering of the human race.

It is probable that viral infections prevent the Zomerschoon tulip and the variegated abutilon from achieving their maximum potential size. But size is not a very significant criterion of success. By making the infected specimens of tulips and abutilon more interesting individuals, the viruses have given them a biological advantage that encouraged their spread. If we choose to call a process, which has carried these lovely plants all over the world and enriched thereby the life of men both literally and figuratively, a disease, then it follows that civilization certainly owes much to disease—for the most interesting and most creative individuals are not necessarily the healthiest members of the species.

FLORIADE (from page 53)

other publications of The New York Botanical Garden, *Addisonia, Brittonia, Economic Botany, Memoirs of The New York Botanical Garden*, and *North American Flora,* will be on display.

Retail Garden Center

How the average U.S. gardening family shops for garden supplies will be demonstrated through a retail garden center. Stocked with merchandise to meet virtually every garden need—from chemicals, seeds, hand tools, power equipment to garden clothing—the exhibit will depict the uniquely American self-service garden supply store.

Exhibit Pavilion

Educational displays by governmental and horticultural organizations will be housed in a special pavilion. Among these are a roof-top garden, typifying urban gardening activity, by the New York Horticultural Society; experiments with plant growth, using artificial light stimulation, by the Men's Garden Club of New York; and the renowned Blue Star Highway project by the National Council of State Garden Clubs.

In vivid variety and contrast are displays by the University of Arizona's Laboratory of Tree-Ring Research and the National Geographic Society on the forty-six hundred year old bristlecone pine, the world's oldest living material; by the Atomic Energy Commission on how atomic research contributes to man's knowledge of plant functions; by the General Motors Tech Center and Connecticut General Life Insurance Co. on the part played in modern American architecture by landscaping.

In addition are displays by Rockefeller Center on horticulture in a major business center; by The Bailey Horatorium of Cornell University; by the Oregon Cactus Society; and by the Pennsylvania Horticultural Society on the sunflower in American Indian rituals.

Your Participation

If you're planning a trip abroad, don't fail to visit the Floriade. Whether or not you personally attend this superb exposition, it is worth considering that you can participate in your country's display of its horticultural accomplishments by sending a donation, however, small, to the U.S. Exhibits Committee of American Horticultural Council.

QUALITY SEED (from page 60)

Top-quality seed mixtures usually have almost all chaff cleaned out. In the process most light-weight seed is also blown off. Research studies have shown that plump, heavy seeds sprout more quickly and grow more rapidly into stouter seedlings than do light seeds. This is another hidden advantage in buying top-quality seed. Inasmuch as the greatest expense in seeding a lawn is for labor to prepare the seedbed, it pays to sow seed that will most certainly make a stand ahead of the weeds. Once the main investment is undertaken, budgeting a few cents more for purchase of only the best seed is being practical rather than extravagant.

Seed more expensive by the pound is not necessarily less economical! Certainly cheap haygrass mixtures are worse than worthless at any price, for in using them one is planting difficult-to-eliminate "weeds." Even medium-grade mixtures containing a lot of nursegrass, although less expensive by the pound, will probably have fewer seeds (potential plants) in that pound than a mix predominately bluegrass – red fescue; bluegrass has over two million seeds to the pound, ryegrass only one quarter of a million.

How to plant and care for a lawn, and keep the weeds out, will have to be the subject of a separate discussion. In planting a lawn remember, however, that unless one starts with quality seed all else will likely be in vain. It is quite possible to "do things wrong," so as to fail to exact full potentiality from quality seed; but you can never "do things right" enough with a poor seed mixture, so as to catalyze it into a top-flight lawn.

A "FOSSIL" LETTER *from* T. D. A. COCKERELL *to* P. A. RYDBERG

By Herman F. Becker

Dr. Becker is Visiting Research Associate at The New York Botanical Garden.

IN REVIEWING the genus *Rosa* at The New York Botanical Garden Herbarium, Dr. Arthur Cronquist, Curator, called my attention to a letter dated August 20, 1910, from Theodore D. A. Cockerell to Per Axel Rydberg. It was pinned to a herbarium sheet together with a small, spiny stem of a rose. Subsequently a second letter was discovered, also from Cockerell to Rydberg, and dated June 26, 1912.

After fifty years or more, men known for their achievements often become legendary to following generations. Biographies are not always written, and the "American Men of Science" reveal only an abbreviated glimpse of their creative work and personal life. Thus a personal memorandum or letter found in an attic, inserted in a book, or attached to a herbarium sheet, contributes a small facet to the personality and to the trend of thought during the lifetime of its author. True, fifty years is not a very long time, but precious facts should be saved from oblivion whenever they are found, just as we do not hesitate to perpetuate an unknown species with a new name, be it of Devonian or Recent age.

The first letter eloquently permits a glimpse into Cockerell's life, illuminating the friendly strife (and sometimes not so friendly) that flourishes among scientists, and without which science could not grow.

Boulder, Col.
Aug. 20, 1910.

My dear Dr. Rydberg.

I found your very interesting letter yesterday, on returning from a trip in the Mts. That prickly fruited rose is surely distinct from *pratincola*—but as to *Macdougallii* and *Underwoodii* I leave you to decide as I have never seen either. (My observation leads me to think that the importance of the infrastipular spines has been exaggerated, however). I found only one plant, which I have moved to my garden. It may have been (the seed) washed down the cañon from miles away, or carried by a bird from a still more distant spot. I will however try to find others. The old canes have slender straight prickles — I enclose a small piece. If we do not find another plant, I think the thing should have some place in your work, either temporarily as a variety(?) — or by mention without names. In my own practice (in zoology especially) I have often introduced a form as a variety, fully expecting that it would later prove a new species. (Rather the reverse is the custom in botany!). I have this year been planting all sorts of wild roses in my garden. I hope in the course of time to have some good observation. Our cinnamomeae of this region doubtless afford a series of forms like the canina of Europe, which it will take a number of years to fully elucidate.

Now about the fossils: since you say that you do not know anything about them, do not think me impudent if I proceed to lay down the law! In the first place it is *not a matter of geology at all, but* of botany. You need geology only as you need geography in the study of recent plants. In the second place, in relation to your Flora, you practically need only to consider the Tertiary plants. The Mesozoic are too doubtful as to genera, and the Palaeozoic hardly different, and all these are too remote to have any immediate bearing on the living floras. Now for a *good* account of the Tertiary strata of North America, which you can easily master, (excluding the details), get Osborn's recent bulletin on Tertiary Mammal Horizons, published by the U.S. Geological Survey. They will send it gratis, this paper is most interesting and significant in relation to living flora.

Now further, so far as the Rocky Mts. (are concerned), the Pliocene is a blank (as to plants) and the nearest thing to the modern flora (perhaps a million years old), of any consequence is the Florissant flora. This is, I would say, very much more important for you than any other—more important than all others combined, as it is relatively complete (with many herbaceous plants) and the plants are very well preserved. Now again, in the studies of the Florissant flora I have practically had to go it alone. The professional palaeobotanists know next to nothing about it, and give practically no help. The recent botanists won't attend to the matter, being busy with their own affairs. There is a comparable fossil flora in Europe, which was described by Heer. Last year I went to Zürich and saw Heer's types, and also went and corrected at Oeningen (Baden) the "European Florissant." Here then is the situation. We have at Florissant a splendid fossil flora, containing all sorts of things which bear on the present flora of the U.S., and I assure you, that if you will once take the trouble to look over even the literature of this subject you will find that you have quite a new idea of the meaning and history of the plant groups familiar to you today. You will be like some sociologist who has discovered that there is such a thing as history.

I write with the greater zeal, from the fact that I have dozens of things, well preserved, many of them that I cannot make out, and if some really competent recent botanist like yourself would get interested, we should doubtless get some very important light. Also, I daresay I have made some errors, which could be corrected. I cannot get anything useful out of Hollick and Knowlton,* nor could I from the European palaebotanists. Hollick described a couple of "new genera" from Florissant, but they are meaningless, and *Fagopsis* is, I am sure, only *Fagus*. I know, of course, that neither you nor any of the other active "recent" botanists will under any circumstances go heavily into palaeobotany — but I do not see why you should not work on it in the same way as you work from time to time on plants from out of your regular range because of the light they throw on your own flora.

I am naturally very eager for the appearance of your new work. What did you decide about *Tradescantia occidentalis* vs. *universitatis*? I still call it *universitatis*, as I cannot see how you can apply Britton's name to a plant which does not live in the range originally assigned. (Goodding's plant is certainly not the same). If you still disagree with me, why not ask Dr. Britton him-

*Well, Knowlton, when he was here, did give me one good hint. But he is working exclusively on the older floras. Hollick's "Tmesipteris" from Florissant is all wrong, and nothing like Tmesipteris at all.

self to arbitrate? Also, there is certainly only one species here.

Some time ago, I went into the *Cnicus, Cardius, Cirsium* matter. I concluded that *Cirsium* was valid for our species here and transferred the local species in ms — but nothing has been published. I rather hope that you will reach the same result.

I have also been at *Cornus*, and make our local species true *stolonifera*, your variety apparently not valid.

I hope you will stick to *Delphinium penardii*, not *penhardii* (of Nelson!). Penard (now of Geneva, a famous worker on Protozoa) is a good friend of mine, and I hate to see his name misused.

Castilleia haydenii, which Nelson credits (comb.) to Greene, was given by me in Bull. Torrey Bot. Club many years ago, in a paper on *Castilleia*.

Yours sincerely
Theo. D. A. Cockerell

Have you considered my *Mertensia secundorum*? It occurs here with *lanceolata*, and is I believe a dimorphic (Mendelian) form of it — but it will take breeding to prove it. The two are always readily distinguished.

Miss Pearl Turner yesterday showed me quantities of *Chrysanthemum leucanthemum*, gathered at the Bluebird mine, in the mts. of Boulder County.

Boulder, Colo.
June 26, 1912.

Dear Dr. Rydberg.

The *Rosa setulosa* matter becomes more complicated. I now find branches with strongly bristly fruit and fruit without bristles, all together! I enclose one herewith. What should be done in such a case?

I find here in Boulder 3 species of *Tragopogon* — two yellow — and one purple *(porrifolius)*. The two yellow ones are probably *dubius* and a variety of *pratensis*. Will let you know further when I have the thing worked out. My hybrid I reported in Daniels, Boulder Co. is *dubius* X *porrifolius*, not *pratensis*.

Yours sincerely,
Theo. D. A. Cockerell

The common *Arnica* here at Boulder, reported so far as *pedunculata*, has not linear leaves. It should rather be *monocephala*. Nelson makes both synonyms of *fulgens*. I think it should be —

(1) *fulgens* Pursh.
(2) *pedunculata* Rydb.
(2a) *pedunculata monocephala* (Rydb.)

T.D.A.C.

Theodore Dru Alison Cockerell, among palaeobotanists affectionately known as T.D.A., was born in 1866 in Surrey, England, and lived to the ripe old age of eighty-two. His interest in entomology and palaeobotany reveals a pioneering spirit, although he was not as prolific as some of his predecessors or contemporaries. Through his association with the University of Colorado in Boulder, Colorado, he had an enviable access to the living flora of the Rocky Mountains, to its fossils, and especially to the Tertiary flora and entomological fauna of the now classical Florissant beds.

In this respect, previous haphazard work on fossils of this area, and an apparent lack of interest and cooperation on the part of his peers, made progress slower than desired. It was not until Ralph W. Chaney's school of the University of California became actively engaged in western palaeobotany that the Florissant was given due attention and its flora thoroughly revised and compiled in Harry D. MacGinitie's outstanding work, *The Flora of the Florissant Beds in Colorado* (Carnegie Inst. Wash. Pub., 599, 1953). By 1890, Samuel H. Scudder had assembled and published a gigantic volume of *The Tertiary Insects of North America* with special reference to the Tertiary lake beds of Florissant, Colorado (U.S. Geological Survey, Territories, vol. 13, 1890).

This work, then, had been available to Cockerell for his various papers on fossil insects and plants, one of which is entitled "Florissant, a Miocene Pompeii." [The Florissant beds are now considered to be of Lower Oligocene age (Chaney and Axelrod, 1959)]. Cockerell's interest in fossils appears to have begun in 1906, resulting in about forty contributions in the thirty years following. Prior to 1906, from 1887 on, about forty botanical papers emanated from his diligent pen. It was his interest in the Rocky Mountain flora which inevitably resulted in professional exchanges with the botanist Per Axel Rydberg.

Rydberg, born in Odh, Westgoetland, Sweden, was associated with The New York Botanical Garden from 1899 and became curator in 1907, a post which he held until his death in 1931. He is known to botany as an outstanding taxonomist and phytographer of the Rocky Mountains and the Great Plains. Two of his favorite families were the *Rosaceae* and the *Compositae* as the references in Cockerell's letters indicate.

The rose specimens referred to and submitted by Cockerell are now placed under *Rosa arkansana* Porter. *Mertensia secundorum* Cockerell is now assigned to *M. lateriflora* Greene, but *Tradescantia universitatis* Cockerell, *Castilleia* (*Castilleja*) *haydenii* (A. Gray) Cockerell, as well as *Delphinium penardii* Huth, remain valid. The fossil *Fagopsis*, of which Cockerell is "sure" that it is "only *Fagus*," has stood the test of time and palaeobotanists and is still known as *Fagopsis longifolia* (Lesquereux) Hollick of the *Fagaceae*. Pollen studies, however, seem to cast doubt on the validity of its family status, and only future research will determine whether it belongs to the *Fagaceae* or the *Betulaceae*.

Thus, after fifty years, some of the old questions are resolved, and new ones are posed to the burden of the coming generation.

HORTICULTURAL EDUCATION (from page 51)

a similar level in the United States. The University of Nottingham, in England, locates its horticultural students at Sutton Bonington, some distance from the main part of the university; it offers a completely scientific training for undergraduate and graduate student and at the same time provides orchard, vegetable garden, ornamental garden, and greenhouse facilities for research. Although their facilities are not located separately, the University of Bristol and Reading University operate in a similar pattern.

Possibly the most concrete way to emphasize the value that is placed on practical experience is to cite an example of a skilled plantsman and craftsman who worked in the botanical garden at Cambridge University. After four years of satisfactory demonstration of his ability, Cambridge University provided him with an opportunity to obtain a Master's Degree. This horticulturist

had not had undergraduate training; but after he had taken courses in plant physiology, taxonomy, and experimental techniques, and published some research, a Master's Degree in Botany was conferred upon him, and he was given faculty status by the university.

Position of U.S. Education

Horticulturists in the United States would be shocked if they realized how few people know what horticulture is. We, as a group, take horticulture for granted. We know what it is, we like it, we like one another—but we tend to spend too much time communicating with one another and not enough time communicating with those who ought to be made aware of horticulture.

Out of twenty thousand students at Michigan State University, there are approximately two hundred students of horticulture. This number is small perhaps because so few know what horticulture is. Young people grow up in a school system which does not expose them to horticulture as a profession.

I am not advocating greatly increased numbers of students of horticulture, but that everyone be exposed to the opportunity to learn what horticulture is. When I was talking recently with a salesman, a young man twenty years old, at a local nursery and garden store, he asked, "Is there any future for a person in this kind of work? You know I had intended to be a beauty operator, until I started to work here. Now I have decided that I would rather work to make the 'outside' more beautiful than to make people more beautiful. I never knew that this kind of work existed." Yes, there are relatively few people who know what horticulture is.

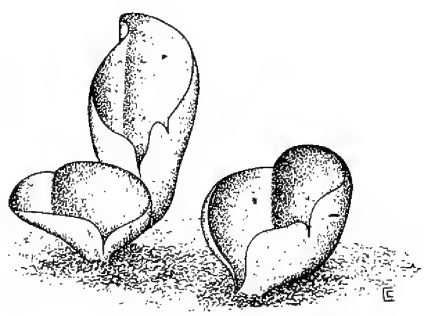
There is a tremendous opportunity for the use of horticulture in helping delinquent children, suburban home owners, and retired men and women....

American universities in recent years may have underestimated the importance of practical experience. Agricultural scientists have worked at being more scientific. The emphasis on science has tended to get out of proportion to the emphasis on practical procedures. Let us not discount the importance of science. There should be better science and more of it, but it cannot become much better unless it is offered to students who have had a practical foundation. Certainly in the minds of educators in foreign countries, horticultural educators in the United States do not command the respect that they deserve. Internationally, our position in horticultural education is both strong and weak. Our strength is exhibited by our emphasis on all the sciences, and by our imagination and ability to seize opportunities for research and to produce results often on the basis of trial and error. Our weakness, however, is in the lack of appreciation for horticulture on the part of the general public and our failure to insist on practical experience as an important requirement of horticultural education.

How to Fill This Void

To improve the appreciation of horticulture on the part of the general public is a slow process, but we must endorse, sponsor, and help to develop vocational outlets for children, adults, and especially teachers. We must increase such programs as the one in operation for children at the Royal Botanic Gardens in Hamilton, Ontario, and the one that is operated by the Department of Education in Cleveland, Ohio. Work will have to be done with colleges to get professional teachers to recognize the importance of horticultural courses of the type that is offered at Farmingdale, Long Island, and at other technical schools, chiefly in New York and California. Courses and lectures for adults similar to those at the Brooklyn Botanic Garden, The New York Botanical Garden, Longwood Gardens, and Morton Arboretum must be endorsed and encouraged.

We must also work toward the acceptance of practical experience as a requirement by universities. Some have it and some enforce it, but it should be a much more thoroughly supervised type of internship, similar to that which is in effect for doctors, dentists, and lawyers. Certainly universities cannot be expected to furnish the opportunities to get practical experience, but universities can serve as the control and not award degrees to students unless the students have been exposed to practical experience. Such a system would improve the professional status of horticulture internationally. A university must be prepared to accept criticism, if it does not make sure that its graduates know the skills required of a good fruit grower, vegetable grower, nurseryman, florist, and specialist in affiliated fields of endeavor. It is the responsibility of our system of education to produce, as well as scientists, young people who will be an asset to the horticultural industry, who will produce and market products to more discriminating consumers and who, at the same time, will contribute cultural values to our way of life.



WHERE THE AIS CAME FROM

The Nineteenth Region of the American Iris Society and The New York Botanical Garden have invited the members of the American Iris Society to a convention in New York City in May 1961, commemorating the founding of the Society at the Garden on January 29, 1920, at a meeting arranged by Dr. H. A. Gleason, then Curator of The New York Botanical Garden, Dr. John C. Wister, and the late Frank Presbrey of Montclair, New Jersey. We believe our readers will be interested in Mrs. E. McGarvey's comments on Dr. Wister's talk at the 1959 convention of the American Iris Society in Oklahoma City. These comments have been excerpted from her article in the August 1959 Newsletter of the Empire State Iris Society.

In John Wister's speech he told from his own recollections "how the Society came into being. We all know where we are today, something about where we are going, but few here know where we came from."

I had read some of the history of AIS, and I also remember a man named Wister, who lived in our neighborhood when I was a youngster. He had a lovely garden and devoted most of his time to flowers and their culture.

I thought this a most desirable occupation for a man, and now I know how abundant has been his reward. I often wondered why he carried a briefcase and was so often seen going in haste to the commuters' station as many

The first trial garden of the American Iris Society was located at The New York Botanical Garden. Picture taken in 1924.

businessmen did. One day I was told by a former schoolmate of his that, "John Wister labors as long on his plants, and interests related to them, as I do on my medical practice."

Delayed in Europe, while waiting to be sent home after World War I, he (John Wister) decided to "look in on" some of the flower growers over there, "to see what they were doing." At the time, he was greatly interested in peonies, irises, lilacs, as well as other garden flowers.

He found good hybrids that were unnamed and unclaimed by their originators, and unknown irises tagged and sold by familiar names. Plants grown from random seeds were being sold by names belonging to other plants, to which they bore some resemblance.

It seemed to Dr. Wister that the iris world was falling into chaos and something had to be done about it. He had the wisdom to see that unless restraints and orderly methods were adopted, by those who were interested in promoting the iris as a cultured plant, it would become increasingly difficult to establish the identity of most iris clones.

Only the initiated could understand the real nature of the problems that beset the iris growers. John Wister was one of these who could.

Iris culture was expanding to create and meet new market demands. This was a most desirable goal, but the methods were destroying the very markets that growers were anxious to build. It was reported that in one large shipment of irises received in this country from Europe, not a single iris was correctly labeled.

While still in Europe, John Wister went to the Royal Horticultural Society seeking direction for the work he planned to do. There he met men who were working on the identification of the species and discovered that they, too, were eager to have improved methods of registration.

He made himself familiar with the work of Sir Michael Foster, the British scientist who laid the foundation for the development of our modern irises. On his return to the United States, he went to see Dr. H. A. Gleason. He made known to Dr. Gleason his plan to organize an iris society that would serve the purpose of giving iris growers and distributors the help and direction so important to the development of this flower.

Dr. Gleason not only approved, he gave Wister the names of men whose background work would qualify any one of them as appropriate choice for president of the society. John Wister found that one after the other, each of these men had some logical reason for not accepting the presidency, yet each of them wanted to hold office when the organization was formed.

William A. Patterson would be glad to be vice-president; R. L. Sturtevant to be secretary; Fran H. Priestly to be treasurer. On reporting to Dr. Gleason that although his chief mission had not been accomplished, he did have excellent volunteers for the other top offices, Dr. Wister then suggested that Gleason himself might have to take on the responsibility. "No," said Dr. Gleason, "I can't do that because I am most anxious to serve on the board of directors, so, John, the job is up to you."

The organization work went on from there. The first Bulletin, published in June 1920, listed four hundred and twenty charter members.

As Dr. Wister spoke to the group gathered for the convention, he spoke to only a segment of the total membership. Yet in numbers we were twice the size of the original membership listed in that first Bulletin. He expressed his personal hopes for future accomplishments. "I would like to see irises in more gardens throughout the land." To hybridizers he suggested that more work be done on the median and dwarf varieties, "since they can be used to good advantage in all garden plans." Fragrance, he feels, has been too often lost in hybrids. As an essential part of their program, he urged breeders to work "toward restoring fragrance."

. . . . Many of us gained a better understanding of the importance of the work of the AIS to the maintenance of orderly progressive improvement in the development, the registration, and distribution of the irises of today. Dr. Wister said, "It is in great contrast to the muddle, in the iris world, of the early twenties."

His last remark brings to light a rare human trait: the ability to be gracious to others for the support of an idea, that it was to their own great advantage to support. Perhaps this trait of graciousness in a totally delightful person is one of the fundamental reasons why John Wister's notion that we should have an iris society became a reality.

It is of interest to know who responded to the invitation extended by Dr. L. N. Britton, then Director of The New York Botanical Garden, to attend the meeting on January 29, 1920: B. Y. Morrison, then of the United States Department of Agriculture, now of Pass Christian, Mississippi; Bertram Farr, America's first notable iris hybridizer; T. A. Havemeyer, then president of the Horticultural Society of New York; Robert Sturtevant of iris fame; Prof. A. P. Saunders; Mrs. Ethel Anson Peckham, Honorary Curator of the iris and narcissus collections at The New York Botani-

cal Garden; Mrs. Frances Cleveland of Eatontown, Mrs. E. P. McKinney of Madison, and Mrs. Charles H. Stout of Short Hills, New Jersey; Mrs. Louise B. Wilder; Lee Bonnewitz; James Boyd, then president of the Pennsylvania Horticultural Society.

Among those interested in the American Iris Society from its very early days, and famous still in the iris world, are Paul Cook, Robert Schreiner, David Hall. The New York Botanical Garden and the Nineteenth Region extend a special invitation to them and others familiar with iris history to attend the convention in May 1961 at the birthplace of the Society. The keynote of this meeting will be the founding of the Society and its accomplishments in the intervening forty-one years.

A Country Housewife's Garden

By Gertrude B. Foster

Mrs. Foster is Editor of
THE HERB GROWER MAGAZINE

ONE OF THE privileges of country living is planning a day's activities according to the weather. An automatic washer and dryer have freed me from worrying about sunshine on wash days, but I am quite happy to go along with the weather in doing other things. In the spring, especially, there are days which suddenly produce sunshine and warmth that bid me to walk in the garden or down to the open meadow. Such blessed intervals, in March, between scudding clouds and sudden snowstorms, may be just a matter of hours. Fortunately I am free to improve those shining hours.

My husband is a great student of weather. He rises early, studies the sky, then checks his weather instruments. For two hours before my breakfast time he receives and transmits reports of weather conditions all over New England over short-wave radio. As secretary of the New England Weather Net, a group of amateur radio operators and weather observers from Maine to Brooklyn, New York, he keeps records of temperature, barometer, wind direction, and cloud cover, three hundred and sixty-five days a year. More than sixty other early risers, who are also "Hams," bestir themselves to get on the air by 5:30 a.m. every day to make up the coverage of the New England Weather Net. This is a service they perform, without any hope of gain, for the information of travelers, farmers, or anyone else who cares to listen to short wave at 3900 Kc. W.B.Z.'s official weatherman, Don Kent, now uses the New England Weather Net reports to augment his own forecasts on TV and radio from Boston each morning.

While Phil has a second cup of coffee with me after the Net, we discuss the doings of the day as dictated by the weather. A warm rain may remind us to pull back the glass on the pithouse to let the rain wash the bay, *Laurus nobilis*. In the coldest weather the sun-heated, deep coldframe needs no watering as long as the sash remains closed. About the time of the spring equinox, we usually get a southwesterly storm (the kind that 'brings the nester') to mark the difference between winter and spring. Such days are called "bad" weather by commercial radio weathermen. To us, they are most welcome. As the natives say, it takes a good rain to settle the mud—especially true in the days of dirt roads. The spring rains are helpful to our long gravel and dirt drive also.

A warm rain in April may be a pleasure to work in—when it falls as fine mist rather than pelting down. Seedlings of hardy annuals, ambrosia, sweet wormwood, or annual woodruff, which have been started indoors, can be set out in the garden on a day when clouds hang low full of the promise of showers. Without sun to wilt the tender young plants, the work of pricking them out is made much easier, and little watering is necessary.

French tarragon and its near relative, *Artemisia schmidtiana nana*, the lovely 'Silver Mound', must be divided as soon as the ground is thawed. Lift the old plants from the earth and gently pull the roots apart. Each section, with a few new sprouts, will make a fine young plant the first year. After the third year, like chrysanthemums to which they are kin, they tend to die out in the middle if not separated. Such pleasant tasks, undertaken during the few hours between showers, are a foretaste of garden work that must wait until May in our climate. There must be fresh winds and plenty of sunshine to dry out the ground enough to have it ready for digging and seed sowing.

I am a miser about signs of spring—I am not eager to hasten it. I want to savor every sun-warmed day and greet each returning bird species. Two weeks ago a pair of bluebirds followed Phil and me on a noon-time walk around the fence line. They flew from post to post. Every once in a while the male took wing to warble a song which seemed to express the joy in our hearts at the matching blue of his wings and back to that of the sky.

One evening there was great excitement on a trip to carry the garbage to the compost pit in the old barn foundation. It started with the sharp buzz of a woodcock's call from the edge of the woods. When I went past the compost pit and down towards the river, I heard the curious "peent," so like an electric buzzer, sounding from different points in the pasture; sometimes ahead of me, sometimes behind me. It took me a while to realize that this was but the curtain call for a drama of feathered love.

It was migration time for the woodcocks. During the day, they kept to the shelter of the low, brushy woods. At dusk they moved down to the meadows where grubs and worms were available to their long beaks when poked in the wet ground. Soon one male took time from feeding to execute a mating ritual, which consisted of a flight straight upwards with a fluttering cry or series of notes. I could make out the hurtling form circling on high at terrific speed, as he was silhouetted against the brightness of the western horizon, where the sun had lately set. As quickly as he went up, he returned to earth.

It was eerie to hear the birds around me on the ground, without being able to see them in the waning light. They had waited until it was dusk enough to make any stump or tuft of grass seem alive before making their appearance in the pasture.

After waiting patiently, until my neck was stiff, for one of the birds to

come near me, I turned towards the house. Suddenly a woodcock dropped silently down in the grass not twenty feet from where I stood. I could feel the electricity of his wings but heard no sound. I could make out the long beak, slightly curved, and the small body on short, teetering legs. While I waited, frozen in my tracks, another dim form floated down and landed behind the big elm tree at the corner of the house. I could feel the birds' consciousness of each other and their wary caution that precluded any buzzing or twittering in my presence. Finally, just before I exhausted my balance, a third woodcock winged into sight to drop down and make a triangle. When I could hold the pose no longer, they rose straight up and angled away, taking great care to keep below the shadow of the hill in the background, so that I felt rather than saw them go.

When I witness such a thrilling performance, I am thankful that the size of our place does not permit our clearing all the tangles of bushes and weeds which make a home for wild life, however contrary this may be to landscape design. A cardinal hopping down from a thicket of forsythia to perform a mating dance, with outspread wings, upon one of the rocks in the rock garden is compensation for not being able to trim all the tangled growth. In May the race between the weeds and the garden plants begins in earnest, so moments for strolling about and observing signs of spring in March and April are sweetly taken.

TALL PLANTS (from page 58)

plum, and dusty pink; bonesets in white and pale plum; purple Joe-Pye-weed; goldenrods and asters in every shade of lavender and white.

In other meadows, generally by themselves, are large drifts of pale lavender beebalms and, where there is shade, the scarlet ones. When these native plants are brought into the garden, they soon form huge clumps likely to crowd out more fragile exotics. So here, even more actively than in most gardening, it is essential to thin the plantings. Gardening always seems to me to be an unending sequence of feeding and encouraging plants and then, when they respond to one's care, of digging out the superfluous or cutting back the ones that have increased too much in girth.

Among the late summer-blooming wildlings, *Asclepias incarnata*, with flowers the color of ashes of roses on stems four feet high, is the best for the border. *A. tuberosa* has popular names indicative of its uses, such as pleurisy-root and wind-root, and of its looks, such as swallow-wort root; it is also known as butterfly-weed, because the butterflies flutter around its umbels of brilliant orange flowers.

One eupatorium I have had for years, because it came intertwined in a shrub from my earlier garden, is *E. perfoliatum*; this is popularly called boneset, sweating plant, and Indian sage. It has cream-white or slightly greyish flowers growing in close heads on stems five feet high.

The violet-colored beebalm is *Monarda fistulosa.* The monarda which most frequently has red flowers, though the flowers come in many other colors, is *M. didyma.* It is popularly known as oswego tea, wild bergamot, and fragrant balm. Botanical differences are slight between the two; in *M. didyma* the bracts beneath the flowers are tinted red, and the leaves sometimes have red veins. There is a bit of lemon with the scent of mint. The red is absent from the bracts and leaves of *M. fistulosa.* Both monardas grow two to three feet high.

Monarda didyma and a third *Asclepias,* namely *punctata*, yield thymol which is antiseptic. Creek Indians made fusions of various monardas with certain of the willows (the particular ones not designated) to give as a drink and bath to patients suffering from dropsy. They also used the fusions as cathartics and for colds.

These are only a few of the many tall plants with herbal virtues, with which to enhance the more naturalistic plantings of herbs in the gardens of today.

BOOK REVIEWS

THE GUIDE TO GARDEN FLOWERS. Norman Taylor. 315 pages, illustrated by Eduardo Salgado, indexed. Houghton Mifflin Company, Boston, Massachusetts. 1958. $4.95.

As a book written mainly for identification of garden flowers, this joint effort of Mr. Taylor and Mr. Salgado is a welcome contribution.

The arrangement of plants results from following the double-branching key with which one starts on the trail of the plant to be identified. The key is very simple, sometimes following the familiar pattern—sometimes quite unique—but essentially easy to follow. One eventually should have his plant in its proper family—and additional leads help him to arrive at the correct species. Just the breakdown of flowers into color groups which the book offers may lead the reader to his objective.

The inclusion of thirty-six plates, which illustrate 324 kinds of flowers, accurately and in very acceptable color, makes the book particularly valuable. The scale used to fit a number of flowers on each plate cannot be proportional, but this detail interferes little with usefulness. The eighty-eight plants represented in line illustrations are also good additions.

Once the identity of a plant has been gained, Mr. Taylor gives brief cultural directions which are adequate and reliable. Native habitat, color, general height and varieties (with which species are tumbled) are also provided.

It is regrettable that the author so often warns his readers about confusion in varieties offered by seedsmen. This would seem to build up a distrust of seedsmen which, in my experience, is undeserved.

One lays aside the book, wishing that more guidance concerning the best varieties could have been included—that more caution against use of plants which often become undesirable in a garden could have been noted. More emphasis on flowering periods would also have been a grateful addition. Perhaps some of the numerous plants which one has little chance of ever seeing could have been eliminated to give space to these important matters.

The main purpose of the book is identification, and for this, it is sure to be a very helpful aid—its fine pictures worth enjoying over and over.

HOWARD W. SWIFT

DESIGNS FOR OUTDOOR LIVING, John Burton Brimer. 420 pages, illustrated, indexed. Doubleday & Company, New York. 1959. $3.95.

With the emphasis of modern outdoor living centering around the terrace, John Brimer's book on woodworking and masonry in relation to the terrace is especially timely.

The most clumsy thumbsmasher takes courage and unconsciously develops an enthusiasm to begin a project because of the simple way the author acquaints the reader with the necessary "know-how" to accomplish his work.

By clean-cut illustrations, the various tools and their uses are presented. This is followed with sizes, kinds and grades of wood materials with descriptions on where best to use each one.

With this start you are soon off the ground — with birds houses, not just any bird houses but specific ones for many kinds of birds. Plant containers, wind shields,

coldframes, trellises and fences appear with numerous illustrations until you suddenly realize you are looking at tool houses—what next, houses? Yes, garden houses and shelters with tables, benches, service carts and potting tables.

But here you are in for a fall. Your attention is suddenly brought back to earth with a display of more tools—this time for masonry uses. Illustrations of steps, ramps, walls, walks and finally the terrace itself in various shapes and surfaces with pools and planters bring this book to a very competent conclusion.

ARTHUR MURPHY
Landscape Architect
Dept. of Parks, City of New York

A NATURAL HISTORY OF NEW YORK CITY. John Kieran. Illustrated by Henry Bugbee Kane. 428 pages, indexed. Houghton Mifflin Co., Boston. 1959. $5.75.

John Kieran has been creeping up on this book for fifty years, actually writing it over the past five years, and with the same unhurried pace he leads us along the waterways and through the fields and backyards and parks of the great city. It will not be a surprise to friends of The New York Botanical Garden that he devotes more than a fourth of the book to the lowly forms of plant life, the flowers and the trees and shrubs of the area, for the Garden has been one of his happiest hunting grounds for many years.

If anything walks, swims, flies, or grows within the city limits or even the nearby parts of Westchester, Long Island, and New Jersey, John Kieran is pretty sure to know about it—probably to have seen it first. He is not reluctant to tell where he found it ("If you walk over the eastern edge of the Van Cortlandt Parade Ground and dip down to what was once the right of way of the Getty Square branch of the Putnam Division Railroad you will be—in the flowering season—up to your ankles in Blue Curls") and, except that it is a thick and therefore heavy book, the Kieran Natural History could almost be used as a field guide. Not that it is technical; it is a "reading book," and there is much pleasure and information for any naturalist—be his interests geology, geography, climate, aquatic creatures, insects, flowers, trees, reptiles, mammals, or birds.

WILLIAM BRIDGES
Curator of Publications
New York Zoological Society

HOW TO PLAN MODERN HOME GROUNDS. Henry B. Aul. 312 pages, illustrated, indexed. Sheridan House, Inc., New York. 1959. $5.00.

Among the planners of home grounds, Henry B. Aul has always had a special place, namely, that of showing by illustration how to actually build garden structures, walks, steps, walls, pools.

In this book he again shows how to meet the problems of the home grounds such as parking, driveway and walk combinations, terraces and planting details with excellent illustrations.

In his enthusiasm for these necessary details, the design or layout for the property has a tendency to be broken up into small sections. This is partly caused by Mr. Aul's leaning toward vegetable and fruit areas. In many cases more emphasis is placed on recreation, games and play areas for children by other designers in the landscape field or in larger grass areas to give a feeling of space on small properties.

(Continued on page 76)

BACK ISSUES AND REPRINTS

All back issues and reprints of back issues of *Addisonia, Brittonia, Economic Botany, Memoirs* of *The New York Botanical Garden, Mycologia,* and *North American Flora* are handled exclusively by Stechert-Hafner, 31 East 10th St., New York 3, N. Y. All inquiries should be addressed to that company.

BOOKS

Stechert-Hafner also sells the following books published for The New York Botanical Garden at these list prices:

Britton: *Flora of Bermuda*		$10.00
Britton and Millspaugh: *The Bahama Flora*		9.50
Gleason: *Plants of the Vicinity of New York*		3.00
Gleason and Collaborators: *The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada**	3 vols.	35.00
*Family Keys from New Britton and Brown Flora**		1.00
Hagelstein: *The Mycetozoa*		7.50
Mackenzie: *North American Cariceae*	2 vols.	20.00
Keys to the North American Species of Carex		Price on request
Rydberg: *Flora of the Prairies and Plains of Central North America*		8.50
Van Melle: *Review of Juniperus Chinensis et al*		1.50

*This work may also be purchased from The New York Botanical Garden. There is a handling charge of $1.00 on The New Britton and Brown Flora.

SERIALS

Addisonia, colored plates of flowering plants accompanied by non-technical descriptions; 8 plates to a part, 4 parts to a volume. Published one part annually. Free to members of the Garden; $10.00 per volume to others.

Brittonia, published quarterly for the American Society of Plant Taxonomists. Subscription included in the Society's dues $6.50 a year. $7.50 per volume to others.

Economic Botany, official organ of the Society of Economic Botany, published quarterly. Members' subscription included in Society's dues $7.50 a year. Subscription to non-members $8.00 a year.

Memoirs of The New York Botanical Garden, scientific papers by members of the staff and collaborators; issued irregularly. Vol. 10, $10.00. Prices of earlier volumes on request.

Mycologia, official organ of the Mycological Society of America, published bi-monthly. Members' subscription included in Society's dues $8.00 a year. Subscription to non-members $8.50 a year.

North American Flora, descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 100 parts issued; now in 2nd series. Prices of parts on request.

The Garden Journal, non-technical articles on botanical, horticultural, and kindred subjects, published bi-monthly. Free to members of the Garden. Subscription $3.00 a year (foreign $3.50) to others.

Subscriptions to the above periodicals should be sent to The New York Botanical Garden. Back issues of The Garden Journal, 75c each, and of The Journal of The New York Botanical Garden, 50c each, are available from The Garden.

BOOKLETS

Catalog of Hardy Trees and Shrubs, a list of the woody plants grown outdoors at the Garden in 1942. Illus. Price 75¢ per copy.

Hardy Ferns and Their Culture. Illus. Price 25¢ per copy.

Flora of the Unicorn Tapestries. Illus. Price 25¢ per copy.

Food and Drug Plants of the North American Indians. Price 25¢ per copy.

Montgomery Conifer Collection, non-technical descriptions of conifers with information on history, habitat, and usage. Illus. Price 50¢ per copy.

Plants of the Holy Scriptures. Price 25¢ per copy.

Succulent Plants of New and Old World Deserts. Illus. Price 50¢ per copy.

Vegetables and Fruits for the Home Garden. Price 25¢ per copy.

The above booklets are obtainable from The New York Botanical Garden.

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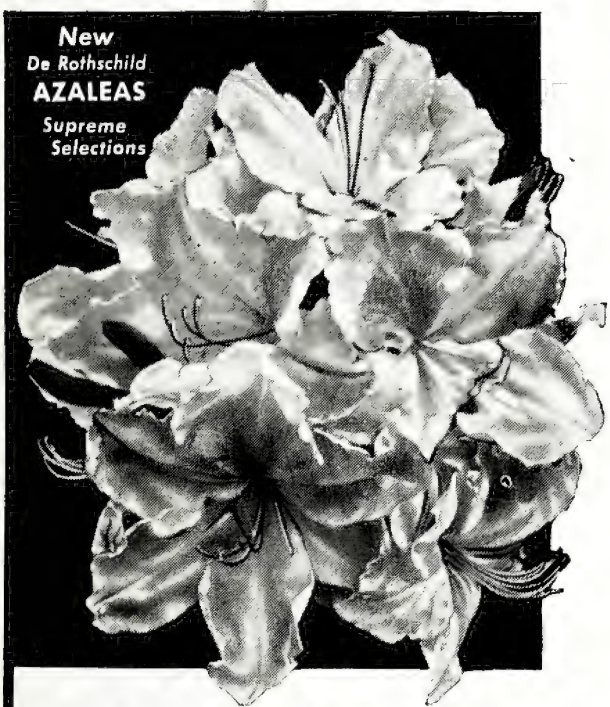

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New ABELIOPHYLLUM, *Distichum,* called white forsythia, is a most beautiful conversation plant. Palest pink when buds open, this 3½ foot, sun-worshiping shrub soon turns into the most welcome snow-white Spring flower-drift you've ever seen.

New VIBURNUM, *Pink Beauty* is a pink Tomentosum that surpasses all other shrubs for delicate and bountiful beauty. Flowers open white and gradually turn to clear, sunset pink. Amazingly, it prefers only the simplest of care.

New MALUS *Red Jade.* A two-season beauty that originated in New York's famous Brooklyn Botanic Gardens. In Spring, this softly weeping tree is a flower-fall of white; in Autumn, the fruit ripens to striking scarlet, a marvelous display.

New ROBINIA, *Friesia* makes a bright three-season showing as patio or lawn tree. Spring brings pale yellow leaf buds that open to rich gold plumes, slowly turning copper as Fall approaches. Thorns gleam red; the shoots, orange—unforgettable color fantasy.

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New DICENTRA, *Bountiful* is a non-stop bloomer. From bud-break in Spring through mid-summer, it produces masses of fuchsia-red flowers that are almost double the size of the common Plumy Bleeding Heart. Early Fall to frost, blossoms again cover its handsome dark green foliage.

New GENTIANA, *Makinoi,* makes a lovely spot of color in late Summer and early Fall gardens. A deep Gentian-blue, celebrated in song and story, new Oriental-import *Makinoi* grows about 12 inches tall and has been proven exceptionally hardy by Wayside testing.

HOSTA, *Thomas Hogg.* An unusually handsome border plant. Large, glossy leaves of richest green are dramatically edged in silver. In early Fall, its lovely lavender flowers are a charming accent.

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New SEDUM, *Indian Chief* provides a gorgeous spot of color in your Fall border. All during the Spring and Summer it offers an oasis of cool, gray-green foliage; then in cooler weather, it tops itself with red-copper blooms that would be stunning against a background of Wayside Chrysanthemums.

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Wayside Gardens

BOOK REVIEWS (from page 74)

The chapter on the swimming pool on the small property shows a modern approach to the small property problems. The question arises as to whether the elimination of the vegetable and flower area or at least substituting a flower border along the property line would give a feeling of more space.

A natural woodland scene shown on page 242 again demonstrates Mr. Aul's versatility in illustration and composition. Here there is a desire however to move the bench shelter and fireplace farther to the east side of the property in order to obtain an uninterrupted distant view that this particular lot affords.

These points do not outweigh the wealth of information that is so clearly presented. The plan on page 265 is a particularly satisfying example of Mr. Aul's design approach to the small property. It is a place you would like to visit.

ARTHUR MURPHY
Landscape Architect
Dept. of Parks, City of New York

JAPANESE GARDENS FOR TODAY. David H. Engel. 270 pages, indexed, illustrations in black and white, and color. Charles E. Tuttle Company, Rutland, Vermont. 1959. $15.00.

Although I am no expert on Japanese gardens, my love for them was deep-rooted in my childhood days, and I have missed them during the forty years of my life in the West. Now that a great interest in things Japanese has developed in America, I look forward to an increase of Japanese influence in gardens as has appeared in architecture.

I know of no other book which could better further such a development than *Japanese Gardens for Today*. In its first section, "The Theory: Why and What," there is a thorough and clear description of the characteristics and the philosophy which are inherent in Japanese gardens.

The second section on "The Practice: How?" is replete with information as to the techniques of designing and construction with details as to plantings and accessories. With such information one could construct an authentic garden of Japan or could draw from it many ideas which could be combined with gardens here.

The book is beautifully illustrated with photographs from almost all the well-known gardens in Japan, as well as from many beautiful private gardens which are not open to the public. I highly recommend this book.

MITSU (MRS. YONEO) ARAI
Greenwich, Connecticut

THE ART OF THE JAPANESE GARDEN. Tatsuo Ishimoto. 128 pages, illustrated. Crown Publishers, New York. 1958. $2.95.

Mr. Ishimoto's book is attractively illustrated (168 photographs) and concisely written, with the thought throughout for the adaptation of the Japanese garden to American conditions. Accompanying many of the photographs are garden plans with arrows showing the location from which the photographs were taken. This aids the reader in visualizing the layout.

Small gardens (17 x 20 feet or less) are mentioned and illustrated. These should be of interest to city dwellers. In Japan, in family-style private gardens "the gardenmaker today works with a relatively free hand." Over the centuries, he "has learned to achieve his natural effects with few and simple materials, to suggest, to hint, to edit and to eliminate."

The table of contents is interesting; each chapter heading is descriptive and informative. For example, "What makes a Japanese garden?"; "Japanese ideas are changing"; "The entry garden welcomes the guest"; "This is a bamboo garden"; "A Japanese garden, Western style."

In the brief summary, it is suggested that in building a Japanese-inspired garden in America, native trees and shrubs can be used that will give the traditional Japanese effect, yet perform well in our climate.

LOUIS BUHLE
Brooklyn Botanic Garden

FLOWER ARRANGING FOR FUN. Hazel Peckinpaugh Dunlop. 119 pages, illustrated. The Viking Press, New York. 1959. $4.95.

Mrs. Dunlop with her extensive experience in the floral arranger's art gives a comprehensive digest of the principles of design as a guide in creating original compositions, using many types of plant materials.

The seven chapters present practical information to assist the flower arranger, decorator, florist, and average homemaker in selecting materials (common or exotic), choosing interesting containers, and properly treating cut-plant materials to prolong their beauty and freshness. Illustrations in color and many in black and white, with one chapter demonstrating step-by-step procedures in placing the parts of the arrangement, and, finally, comments on rules, shows, and judging complete the contents of this informative book.

Predominantly, the compositions show the Japanese influence, which is pleasing in its naturalistic charm. The line-mass arrangements are a blend of the East and West concepts, and are interesting in form and pattern.

The quality and distinction of Mrs. Dunlop's choice of containers and plant materials are inspirational, and there is much useful information for the beginner as well as the experienced exhibitor. *Flower Arranging for Fun* would be a worthwhile addition to any arranger's bookshelf.

MRS. WILLIAM A. MCGREGOR
Bronxville, New York

THE ENCYCLOPEDIA OF ORGANIC GARDENING. J. I. Rodale and staff. 1145 pages, illustrated. Rodale Books, Inc., Emmaus, Pennsylvania. 1959. $7.00.

The authors in this well-printed "non-technical" compilation observe the Bluegrass Line less consistently than the *Organic Gardening and Farming* line. While many writers are qualified authorities, some peculiar, horticulturally outgrown, and often conflicting opinions are perpetuated. Thus on American persimmon, there's a choice of "ripening from the middle of summer through December," or (by a landscape architect) "frost action is necessary to make it palatable." In two pages on the azalea, not one species or clone is named, but "it is an evergreen plant all year." Mendelism, crossing, and orchard pollination are clearly discussed at various lengths, but evidently the "mimosa" article's writer has unusually sensitive plants, for "to insure bloom, you will find that mimosas are like holly and many other trees — you will need two or more. Sometimes single ones bloom and sometimes they do not." (The plural ones, invariably?) Under "cacti," we learn that they won't stand frost, and: "How hybridizing is done. Onto the top of every plant another cactus is grafted. Vari-colored and unique flowers result from this procedure." Also, "Roughly speaking, we can divide the cacti world into three sections: cacti generally, orchid cacti, succulents."

This book needs smoother speaking and rougher editing.

J. C. MCDANIEL
University of Illinois
Urbana, Illinois

AN EASY GUIDE TO HOUSE PLANTS. Arno and Irene Nehrling. 100 pages, illustrated, indexed. Hearthside Press, New York. 1958. $2.95.

The book is a must for housewives who want to decorate with house plants and for those who have planters built into their new homes. The aim of the authors is to make indoor gardening as easy as possible, even for the beginner.

Decorations with plants in groups and in planters has been covered extensively, from the choosing of plants from the florist to the methods of putting them in the planter. Plants are listed, with illustrations and diagrams, according to exposure and water

(Continued on page 81)

Diseases and Pests of Ornamental Plants

by P. P. Pirone, B. O. Dodge, and H. W. Rickett
Third edition, 1960. 760 pages, 6x9,
221 illustrations, index.
To be published in March 1960

This complete, well-organized book has become a standard reference guide for both the professional and the serious amateur gardener. Comprehensive and authoritative, it covers the pests and diseases of nearly five hundred genera of ornamental plants (including lawn grasses) grown in the United States, and their control.

The new edition is 122 pages larger than the second edition, and has more illustrations.

Diseases and Pests of Ornamental Plants is an official publication of The New York Botanical Garden.

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NEWS, NOTES and COMMENTS

Redwoods Exhibit. As part of the Redwoods Exhibit at The New York Botanical Garden, a Tertiary fossil collection of the "dawn redwood," *Metasequoia occidentalis*, and plants associated with its age and habitat is displayed in the rotunda of the second floor of the Museum and Administration Building.

Discovery of the living dawn redwood, *Metasequoia glyptostroboides,* some fifteen years ago, caused as great a stir in palaeobotany as did the discovery of the first coelacanth, *Latimeria*, a few years earlier. Both, up to that time believed to be extinct, are now considered classical "living fossils." This exhibit permits a glimpse into the ancestral history of the dawn redwood and a comparison of its evolutionary progress during geologic time. Wherever feasible, herbarium specimens of living plants have been placed next to the fossil shale imprints, demonstrating the remarkable similarity of some fossil leaves, fruits, and seeds to their living equivalents. Fossil *Metasequoia* and its associated flora originate from the Oligocene Ruby assemblage in southwestern Montana and are here represented by exquisite imprints of mostly new species. The similarity between fossil and extant specimens of *Metasequoia* and some of the angiosperms displayed suggests the slowness of the evolutionary process in some plants, emphasizing their conservative development during the past twenty-five million years.

This unique display was arranged by Dr. Herman F. Becker, Visiting Research Associate of The New York Botanical Garden. Other members of the Garden's staff, including Dr. H. W. Rickett, Acting Assistant Director (Botany) and Miss Elizabeth Hall, Librarian, also aided in the preparation of the comprehensive educational exhibit on the redwoods.

It was set up by the Redwood Grove, the National Parks, the Conservation, and the Horticultural Committees of The Garden Club of America for The New York Botanical Garden. Many organizations and many individuals cooperated by furnishing plant materials, minerals, books, photographs, and prints.

The Save-the-Redwoods League sent plant material — ferns, cones, branches of shrubs and trees, and redwood products. The Redwood Association sent redwood products, living trees, and posters and other material to demonstrate reforestration and selective cutting.

Minerals from northern California came from Dr. Ian Campbell, Chief of the Department of Mines of the State of California, and minerals from southern California were provided by the U. S. Borax and Chemical Corporation. The California Academy of Science loaned mounted birds.

Included in the exhibit are mural photographs from the National Parks Service; large colored photographs of the National Parks from the National Geographic Society; photographs of reptiles, amphibians, and mammals loaned by the American Museum of Natural History and the New York Zoological Society, and of birds loaned by the National Audubon Society's office in Berkeley, California; also photographs of the high Sierras loaned by the Sierra Club of California.

Several artists have contributed their talents to enhance the exhibit. Miss Shirley Miller of the National Audubon Society created a diorama of the redwood forests. George Peterson of the American Museum of Natural History modeled a trunk of the famous General Sherman tree in Sequoia National Park. Marion Tatum of Palo Alto, California, prepared four serigraphs of the flora of the redwoods. John Cameron Yrizarry, a nature artist of Brooklyn, New York, painted murals of these big trees, *Sequoiadendron giganteum* and *Sequoia sempervirens*.

Books on the birds of California, loaned by the National Audubon Society, and books on the plants of the coastal regions and the Sierras, loaned by The New York Botanical Garden, augment this extensive exhibit which illustrates the importance not only of saving the redwoods themselves, but of protecting the plants, birds, animals and other organisms that make up the ecology of the redwoods. The exhibit which opened on January 15 will close on March 15.

Tribute to August C. Pfander. The Board of Managers of The New York Botanical Garden, at its meeting October 29, 1959, paid tribute to Mr. Pfander who retired on November 1, 1959, after twenty-seven years of loyal and efficient service to The New York Botanical Garden.

Mr. Pfander entered the service of the Garden in September 1932 as a construction foreman for the then newly started Thompson Memorial Rock Garden, upon the completion of which, in appreciation of his outstanding abilities, he was retained in the permanent employ of the Garden. Subsequently, Mr. Pfander advanced to the position of Assistant to the Superintendent, Superintendent of Buildings and Grounds, and finally to that of Administrator.

By reason of his position, he was in constant touch with the maintenance group of employees and was particularly effective in fostering their morale.

On October 23, 1959, the staff and other employees of the Garden tendered Mr. Pfander a farewell party and presented him with a suitably engraved gold watch.

National Science Foundation Grants to the Garden. The National Science Foundation awarded The New York Botanical Garden a grant of $46,900 for the support of basic research entitled "Investigation of Phylogenetic Relationships," under the direction of Dr. Alma W. Barksdale, Research Associate. The grant, which became effective December 22, 1959, will be three years in duration.

A. C. Pfander

The National Science Foundation awarded the Garden a grant of $12,600 for the support of basic research entitled "Proposals for Conservation of Botanical Names," under the direction of Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer. The grant became effective in December 1959 and will last five years.

Membership. New members are being added to The New York Botanical Garden. Over 700 have been enrolled since the membership campaign was initiated.

You can assist in the Membership Drive by sending the names of prospective members to the Membership Secretary, The New York Botanical Garden.

Fund for Library Wing. Mrs. Hermann G. Place, Vice-President of The New York Botanical Garden and Chairman of the Building Committee, has announced that gifts for the proposed library wing, at the end of January 1960, totaled $148,000. The largest individual contribution is $31,020 for the reading room.

F. A. Bartlett medal, an award of the American Horticultural Council, made possible through the generosity of F. A. Bartlett, of Stamford, Conn. The first presentation was made to Bernard H. Slavin at the fourteenth American Horticultural Congress in Rochester, N. Y., October 1959.

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Gift to the Library. R. Gordon Wasson, Treasurer of The New York Botanical Garden, presented to the library the beautifully illustrated *Les Champignons Hallucinogènes de Mexique* by Roger Heim and R. Gordon Wasson.

Dr. William C. Steere, Director of The New York Botanical Garden, attended the meetings of the Biological Sciences Curriculum Study Committee of the American Institute of Biological Sciences, held in New Orleans, Louisiana, on January 28 and 29, 1960. Dr. Steere addressed an assembly of the members of the Redwood Grove, the National Parks, the Conservation, and the Horticultural Committees of the Garden Club of America and their guests on February 4th. The luncheon-meeting was held at the Garden in connection with the Redwoods Exhibit.

Dr. Steere will deliver an address at the annual meeting of the Fairchild Tropical Garden to be held in Miami, Florida, on March 24, 1960.

Dr. Steere has received a grant from the Arctic Institute of North America for support of a field study and evaluation of arctic mosses in northern Alaska during this coming summer.

Staff Activities. Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, and Mrs. Maguire returned from their five months expedition to South America the last week in January.

Dr. Richard M. Klein, Alfred H. Caspary Curator, and Miss Georgia E. Manos presented a paper on "The Use of Metal Chelates for Plant Tissue Cultures" at a conference on chelation at the New York Academy of Sciences.

Dr. Arthur Cronquist, will direct the 1960 Summer Institute for high school students to be given at the Garden under a grant from the National Science Foundation.

Dr. Marjorie Anchel, Research Associate, attended a four weeks course in radioisotopes at the Oak Ridge Institute for Nuclear Studies.

Recognition of Dr. Pirone. Dr. P. P. Pirone, Plant Pathologist, was presented with an award certificate by the New York State Arborists Association in recognition of leadership, devoted service, and interest in the better appreciation of and the preservation of shade trees.

Appointment. The New York Botanical Garden has appointed H. Wilson Lloyd to assist in the Garden's public relations and promotional activities. Mr. Lloyd is head of his own public relations firm in New York.

Dr. J. J. Wurdack has tendered his resignation as associate curator of The New York Botanical Garden, effective February 1, 1960, to become an associate curator in the Department of Botany, Natural History Museum, Smithsonian Institute, Washington, D.C.

Outdoor Gardencraft. Registration started in the middle of January 1960 for this course in outdoor vegetable and flower gardening for a limited number of children between the ages of nine and sixteen. The course will open at The New York Botanical Garden on March 26, and will be given on Saturday mornings until school closes. Thereafter, instruction will be given on week-days by Mrs. Lillian Weber, Instructor, assisted by Miss Nancy Callaghan and John Dowling.

Pelargoniums on Display. The New York Botanical Garden has been adding to its pelargonium collection, and one hundred and fifty species, varieties, and hybrids were displayed in the Conservatory during January and February.

Hippeastrum procerum, the blue amaryllis, is a native of Brazil and grows in the crevices of steep granite cliffs in the Organ Mountains near Rio de Janeiro. A bulb of this rare plant, received at The New York Botanical Garden eleven years ago, was brought into flower on December 19, 1959, and remained in flower until January 9, 1960.

H. procerum was previously flowered at the Garden in 1941 and at that time remained in flower for almost three weeks.

Until 1930 or so, one could count on his hand the number of times *H. procerum* had been flowered under cultivation, according to T. H. Everett, Assistant Director (Horticulture) and Curator of Education of The New York Botanical Garden. In more recent years, there have been more frequent reports of its flowering under cultivation.

Though *H. procerum* grows from seed in the wild, it is seldom that plants are raised from seed under cultivation. Louis P. Politi, Horticulturist of the Garden, succeeded in raising seedlings of the blue amaryllis this past winter.

Recent Visitors at the Garden. Within recent months, the following have visited The New York Botanical Garden:

Dr. Geneva Sayre, Russell Sage College, Troy, New York.

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Dr. Llewelyn Williams, U.S. Forest Products Laboratories, Madison, Wisconsin.
Dr. B. A. Friedman, U.S.D.A., New York, New York.
Rev. Jean M. Bauchel, Paris, France.
Dr. R. R. Fenska, Bartlett Tree Experts, White Plains, New York.
Dr. Fred A. Barkley, Warner-Lambert Pharmaceutical Laboratories, Morristown, New Jersey.
Dr. Lewis E. Anderson, Dept. of Botany, Duke University, Durham, North Carolina.
Dr. Harold J. Humm, Dept. of Botany, Duke University, Durham, North Carolina.
Dr. Josiah T. Lowe, Syracuse University, Syracuse, New York.
Dr. Robert Gilbertson, Syracuse University, Syracuse, New York.
Dr. K. Lem, Goucher College, Baltimore, Maryland.
Miss Arlene C. Kane, National Parks Association, Washington, D.C.
Dr. Harrison Nelson, The Upjohn Company, Kalamazoo, Michigan.
Dr. Walter Sokolski, The Upjohn Company, Kalamazoo, Michigan.
Dr. Robert L. Shaffer, Dept. of Botany, University of Chicago, Chicago, Illinois.
Miss Teresa Salazer, Bogota, Columbia.

Torrey Botanical Club. Dr. Karl Maramorosch of Rockefeller Institute gave a talk on "Friendly Viruses" on December 15, 1959; Dr. Leonard H. Weinstein of Boyce Thompson Institute for Plant Research a talk on "The Basic Considerations in the Preservation of Cut Flowers" on January 5, 1960.

At the annual meeting of the Torrey Botanical Club on January 19, 1960, Dr. George L. McNew, Acting Director of Boyce Thompson Institute for Plant Research, spoke on "Administration—The Art of Living with Scientists."

On February 6, 1960, Prof. Robert L. Starkey of Rutgers University lectured on "The Microbial World and Plant Roots." On February 16, 1960, Dr. Herman F. Becker, Visiting Research Associate at The New York Botanical Garden, talked about his "Plant Fossil Expedition to Montana—New Species and By-Products."

On March 1, the members of the Torrey Botanical Club will hear a lecture by Dr. Paul Burkholder, Director of Research of the Brooklyn Botanic Garden, on "Biological Research in the Antarctic." This lecture will be given in Larkin Hall, Fordham University. On March 15, in Schermerhorn Hall, Columbia University, Prof. Philip Mayerson of New York University will address the club on "Desert Ecology: Flora and Ancient Agriculture in the Negeb."

Dr. Ralph R. Stewart, Director of Gordon College, Rawalpindi, West Pakistan, India, recently addressed a "Gordon College News Notes" to his friends at The New York Botanical Garden. He and Mrs. Stewart are due to sail for their terminal furlough on May 6, 1960, as he reaches his seventieth birthday in April.

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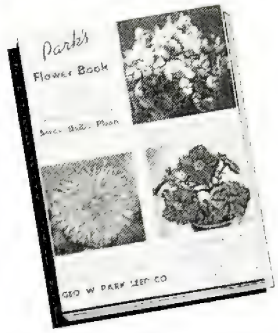

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5" Bloom, Ht. 3 ft., May, June
MURRAY RUSSELL (D) RED
Profuse Bloomer, Ht., 2½ ft., April, May
NANETTE RUSSELL (E) YELLOW
7" Bloom, Ht. 2½ ft., April, May,
PINK ALLURE (D) PINK
3" Bloom, Ht. 2½ ft., June, July
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Small Red, Blooms Profusely, Ht. 3 ft., April, May, July, August

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The U. P. Commission, which supports Gordon College and Forman College in Lahore, with many more in other parts of the world, expects that its staff on furlough will engage in a certain amount of speaking. So Dr. Stewart plans to give some lectures. Then, if he continues to enjoy good health, he will spend about a year in Great Britain working on botanical problems which he has not been able to complete because of the many demands on his time.

Dr. Daskawie, who spent an interesting furlough in the United States, returned to Rawalpindi in September 1959 to assume the principalship of Gordon College.

Rev. H. R. Fuger of Allahabad, who was living in Gordon Hall when Dr. Stewart arrived there in 1911, retired last September after forty-nine years of service. Dr. Milford Barnes and Dr. H. J. Stewart, who went to Gordon College in 1905, are retired and living in the United States. Dr. S. C. Picken, who preceded Dr. Stewart in the Biology Department, and Prof. W. L. Porter, who started some of the science classes before leaving in 1907, are also living. And Dr. Stewart recently heard from his cousin, Prof. C. A. Stewart, who arrived in Rawalpindi in 1913, and from Prof. W. H. Merriam, who, he believes, arrived in 1907.

It can be understood why Dr. Stewart ends his interesting letter with—"If you want to live long, come and teach in India and Pakistan."

Dr. Henry Andrews, Dean of the School of Botany, Washington University, will leave in May 1960 for the University of Poona, India, as he has been granted a Fulbright teaching fellowship for a year's study there. Dr. Andrews will teach a course in palaeobotany.

He will return to St. Louis by way of Jimma, Ethiopa, where he will inspect an agricultural research program directed by Hugh Rouk, a graduate student completing requirements for his doctorate from Washington University. The program is sponsored by the University of Oklahoma.

Wilhelm Ruhland, formerly Director of the Botanic Garden and Institute at Leipzig, Germany, died at Wurttsburg in January 1960 (date not specified) at the age of eighty-two. He was editor of *Handbuch der Pflanzenphysiologie.*

Burpee's Introductions for 1960. Seventeen annuals are being introduced this spring by W. Atlee Burpee Co. of Philadelphia; among them are three All-America bronze medal winners. These are 'Toreador', an F_1 hybrid American marigold, mid-orange in color; 'Glamour', a tetraploid annual phlox in mid-salmon; and 'Vanguard', a hybrid double snapdragon with tapered spikes of cerise-rose flowers.

Burpee considers one of its introductions, Gloriosa Golden Daisy, to be one of the outstanding flowers for 1960. The original gloriosa daisies were developed from black-eyed susans by Dr. A. F. Blakeslee of the Carnegie Institute of Washington at Cold Spring Harbor, New York, and of Smith College, Northampton, Massachusetts. Over a period of forty years, Dr. Blakeslee selected and hybridized the best he could find of this native flower. He then created tetraploids for greater size and vigor.

All-America Mum Selections for 1960. Chrysanthemum breeders are developing early flowering garden mums that also meet the demand for long-lasting quality as cut flowers. These mums bloom well in Minnesota and the Northwest or New England and southern Canada before normal winter freezes set in. Other new varieties are medium-early, that is, they start to flower in October and continue to do so until killing frost. Except in extreme northern localities, these new mums have a long-blooming season without protection.

1960 All-America Mum Selections are 'Mardi Gras', a fully double, large-flowered, red and yellow; 'Headliner', described as having four-inch walnut-coral flowers; and 'Pink Cherub', a purplish pink pompon.

A New Strawberry. 'Sonjana', a climbing strawberry, was developed by Reinhold Hummel, a West German nurseryman, and named after his daughter Sonja. It is being introduced in this country by Wm. Penn Nursery Co., West Grove, Pennsylvania (a subsidiary of The Conard-Pyle Co.) under Plant Patent No. 1691.

When this plant was exhibited at the horticultural show in Stuttgart, Germany, people were amazed to see that it had been trained in festoons covering an archway and in the shape of wreaths. 'Sonjana' is both an ornamental plant as well as the producer of middle-size, firm, and meaty berries. Because of the weight of the berries, the vine has to be tied at intervals to its support—a trellis or pole, or wire netting. It can also be grown in large tubs or jars on the terrace or patio—with the runners trained upward to a trellis or allowed to drape over a wall. As sunlight and air all around the plant are essential, it is advisable not to train this climbing strawberry against a solid wall.

American Dahlia Society. At the annual meeting held in New York City on January 16, 1960, Bertram E. Pitt of Richmond Hill, New York, was elected president; Edward B. Lloyd of Montclair, New Jersey, re-elected secretary; Mrs. Caroline Meyer of Bergenfield, New Jersey, re-elected assistant secretary; and Harry A. Dreyer of Ridgewood, New Jersey, re-elected treasurer.

The financing of a research program on dahlia diseases was referred to the Executive Board for further consideration.

The annual exhibition, in cooperation with the Dahlia Society of New Jersey, will be held in the Civic Auditorium of the Garden State Plaza, Paramus, New Jersey, September 21 and 22, 1960.

The proposal to cooperate with the National Association of Gardeners in September on the occasion of that organization's fiftieth anniversary in Asbury Park, New Jersey, received favorable consideration.

The fiftieth annual exhibition of the American Dahlia Society will be held in 1964, with Secretary Lloyd heading the exhibition committee to cooperate and coordinate the Society's plans with those of the 1964 World's Fair Corporation.

Horticultural Society of New York Awards. At the annual meeting of the Horticultural Society of New York, held on January 20, 1960, Kingwood Center of Mansfield, Ohio, received the Society's distinguished service award "for outstanding contribution to the advancement of horticulture by an institution." In the presentation, Dr. Albert J. Irving, Chairman of Awards, pointed out the international commendation which has been won by Kingwood Center for cultural education and research, since its organization in 1953 under the will of the late Charles K. King, and to its phenomenal development of its service program under the direction of Dr. Raymond C. Allen.

The special award to "a professional horticulturist for outstanding accomplishments and contributions" was presented to Dr. Donald Wyman, Horticulturist of the Arnold Arboretum since 1936. He is lecturer, consultant, and author of many articles and books, two of which brought him the Norman Jay Coleman Award of 1949 and 1951.

The Society's award to an amateur for outstanding contribution to horticulture was presented to Mrs. Charles Doscher. She has served as president of the Federated Garden Clubs of New York State, Inc., as director of five other important organizations, and as director and chairman of the Horticultural Society of New York's lecture committee, and has been largely responsible for the increased attendance at lectures.

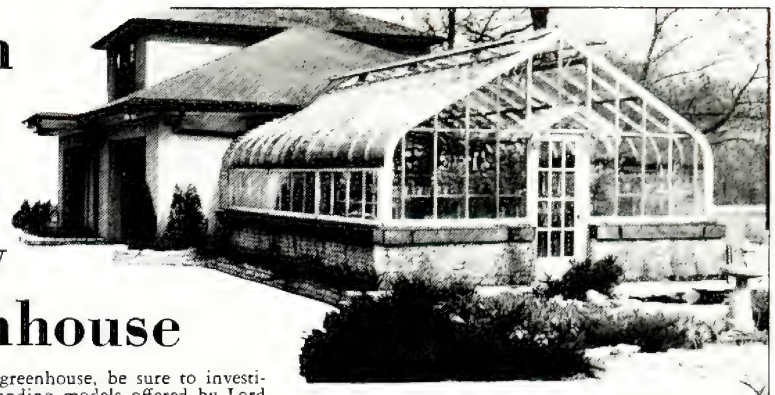
National Flower Election results were announced the last week in January, 1960. The rose garnered 386,841 of the 1,055,129 votes cast in the election conducted by the Florists' Telegraph Delivery Association. This was more than twice the total number of votes of its nearest competitor, the carnation. In third place was the chrysanthemum; in fourth place, the lily-of-the-valley.

The returns have been sent to Senator Joseph C. O'Mahoney (D. Wyo.), Chairman of the Senate Judiciary Subcommittee on Federal Charters, Holidays and Celebrations, and to Congressman Omar Burleson (D. Tex.), Chairman of the House Committee on Administration.

Forty-three nations list national flowers. Among major nations, only the United States and Soviet Russia have not proclaimed an official flower.

For more than forty years, the selection of an official flower has been discussed in Congress. During the last session, fifteen different bills, nominating various flowers, were introduced. If Congress should decide to select the rose as the official flower of the United States, it will become the fifth country to do so. The rose is the national flower of England, Iran, Honduras, and Luxembourg.

When you select a new Greenhouse



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BOOK REVIEWS (from page 76)

preferences, so the mistake cannot be made of putting plants together that are not-compatible. Lists are also given for special bloom and holiday use.

The technical aspects such as plant requirements, care, and propagation are covered concisely with diagrams showing different methods. Water gardening is also explained.

A "dictionary' of over one hundred house plants gives the popular and botanical names, ultimate size, care hints, soil and water requirements, and method of propagation.

Growing bulbs indoors for bloom and inexpensive methods of growing plants under artificial light open new fields even for the experienced. Hints on how to decorate the terrace with potted plants are interesting.

The book is easily read, well illustrated and should be on every indoor gardener's bookshelf.

MARY F. JOHNSON
Pompton Lakes, New Jersey

POPULAR STYLES OF JAPANESE FLOWER ARRANGEMENT. Lida Webb. 124 pages, illustrated, indexed. Hearthside Press, Inc., New York. 1959. $2.95

This is truly a needed guide and will be welcomed by the beginner as well as the advanced arranger.

The capsule approach is a most interesting representation of many phases of Japanese flower arranging, and one will benefit greatly by the schools, well known to us, that are demonstrated in this book.

All the necessary information is given, including numerous illustrations emphasizing the basic forms, placements and controls.

The author went all out to include in this book a suggested scale of points for "Judging Arrangements in the Japanese Manner."

The style of each individual school is easy to follow and will be of inspiration in creating beautiful flower arrangements.

HERTHA A. BENJAMIN
New York, N. Y.

THEY EXPLORED! Rhode Hoff and Helmut de Terra. 120 pages, illustrated. Henry Z. Walck, Inc., New York. 1959. $3.25

This is a collection of vest pocket summaries of facts of great explorers. The epic of their accomplishment loses some of its factual picture through condensation. To the mind of a ten- to fourteen-year-old, vastly stimulating avenues of adventure and learning are opened. The text is at its best when it quotes from the notebooks of the explorers, Humboldt, Livingston, Fremont, Hedin, Scott, and Herzog. They color the content with their heroic personalities.

The vital transformation of the impossible to the improbable to reality, as the struggles and obstacles are enfolded and overcome by these great men, contains the message of inspiration the book holds for the youngsters.

The explorations described occur from 1769 to 1950. The account of the feat of Herzog in 1950 lends a contemporary feeling to the book which is important to a child. This feeling has been captured and the conclusion has been conveyed that, "this could happen to me."

MRS. SAM LASKER
Scarsdale, N. Y.

WILD FOLK AT THE SEASHORE. Carroll Lane Fenton. 128 pages, illustrated, indexed. The John Day Company, Inc., New York. 1959. $3.50.

Here is a charming addition to the long list of Carroll Lane Fenton's other outstanding books on Nature. This time he has set the scene of his dramatic story at the ocean and has supplied an impressive cast of characters.

To make his descriptions attractive to children, the animals are given names: Larus the Sea Gull, Terri the Starfish, Mother Moon Snail, Big Claw the Lobster, and a whole clan of Crabs. There are others too, all of whom go through adventures and dangers that can occur only near, over or in the ocean.

This is, of course, a book designed for children. It is told with an awareness of what will appeal to the child's sense of excitement. But, except for the device of giving human names to the animal characters, the author emphatically does *not* talk down to his young audience. In every respect, this is an authoritative work. No naturalist would quibble as to the authenticity of the information in the book. And

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May-June Issue
for
1960
BULB OFFER
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Members Only

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A special insert in the May-June 1960 issue of *The Garden Journal* will describe the bulbs from Holland for fall 1960 planting that will be offered only to members of The New York Botanical Garden. An order blank and shipping label will be included in the insert. . . . . The 1960 Bulb Offer to members of the Garden will be presented only through the pages of the May-June 1960 issue of The Garden Journal.

the line drawings, appearing on nearly every page, serve beautifully to identify and distinguish the various species discussed in the text.

The children should love it. So did I.

SYLVIA STEIN
New York, N. Y.

CELL, ORGANISM AND MILIEU. Dorothea Rudnick (Edited by). 326 pages, illustrated, indexed. The Ronald Press, New York. 1959. $8.00.

Each summer, for the past seventeen years, a relatively small number of botanists and zoologists have met on a university campus to discuss some of the amazing and exciting processes by which cells and organisms grow and change. The pace of the sessions is leisurely, laughter and some excellent meals punctuate the scientific parts of the program and, withall, they are among the most rewarding and stimulating symposia held in any year. Each day, members of the Society or invited guests present detailed reports on their own research activities with emphasis on the relation of the specific topic to general biological thought. Following the formal presentation, each paper is carefully discussed by the group from many points of view. Ideas are freely exchanged; "Did you do thus and so?" "What would happen if. . . .?" "What is the relation of this to. . . .?" "Does this check with the results of. . . .?" No participant could possibly leave the symposium without more ideas than he could use in two lifetimes.

The Society for the Study of Development and Growth, recognizing the importance of their symposia has, each year, published the papers given at the meetings. Each volume contains major laboratory and "thinking" research papers on the frontier of biological endeavor. Not infrequently, a paper becomes the point of departure for an entirely new line of research. Although written by specialists, the viewpoint is deliberately of sufficient breadth that virtually any biologist will find himself enthralled by topics remote from his own primary interest.

The theme of the present volume, "Differentiation and growth in response to a changing chemical environment" is exemplified by topics seemingly as far apart as the growth of roots and insect growth hormones. As the reader will discover with pleasure, these subjects are very close together.

RICHARD M. KLEIN

INTRODUCTION TO HISTORICAL GEOLOGY. Raymond C. Moore. Second edition. 656 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1958. $7.95.

Geology texts are a matter of choice in college or university departments, and the first edition of this book was widely used throughout the United States. The present volume is considerably expanded and brought up to date by inclusion of new information in geology and palaeonecology accrued during the past decade.

Following the traditional presentation of historical geology, the material is, as expected, ably presented by this eminent author. In classical sequence, the "principles of historical geology" are followed by the evolution of life, including Man, the eras from the beginning of the Earth to Pleistocene glaciation, and interspersed by chapters on the nature and evolution of life for the respective systems. The Cenozoic, or youngest era, for which exists more geologic and fossil information than for any earlier span of time, is divided into two newly created systems, the Paleogene and the Neogene. The former comprises the more tropical Paleocene, Eocene, and Oligocene epochs with its ancestral mammalian and plant life, while the Neogene of Miocene, Pliocene, and Pleistocene age deals with aspects of modern plant and animal life under more temperate conditions.

Numerous charts, figures, and maps provide excellent basic knowledge for the student as well as the layman. The book is profusely illustrated with diagrams, drawings, and photographs (some full page), many of which are reproductions of the famous geologic landscape restorations by C. R. Knight.

An excellent appendix on "characters of organisms represented among fossils" (including plants) and a voluminous glossary make this book one of the foremost texts in its field.

HERMAN F. BECKER

PLANT LIFE. Lorus J. Milne & Margery Milne. 283 pages, illustrated, indexed. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1959. $6.95.

Many friends of the gifted authors of this book will be glad that they have divided the material treated in *The Biotic World* and *Man* into two independent reviews. *Plant Life* is an interesting and well-organized book. While presenting the facts of elementary botany, it is refreshingly different from the usual text. It offers a partial solution to the problem of planning a course suitable not only for the future botany or biology major but for the non-science major as well.

Less than twenty pages on the kinds and values of plants arouse interest in microorganisms as well as in higher forms. Before further details are given, protoplasm, cells, and exchange with the environment are discussed. The chapter "Energy Relations of Life" includes a figure showing "the salient features of a 1958-model understanding of photosynthesis" and some discussion of enzymes and vitamins. The chapter on heredity includes two pages on the nature of the gene. There is a great deal of information in the book, concisely and skillfully presented. The student is made aware of the role of plants in nature and their significance in his own life; of recent advances in plant science and current problems in the field. Though technical terms are cut to a minimum, derivations are consistently given. As in the earlier book, the authors have included a wealth of excellent illustrations, most of them made by themselves.

One would like to say that no inaccuracies were noted. In a book of this caliber, one is surprised to read that, in the order Cordaitales, "cycad-like seeds were borne along the frond margins"; that a banana plant "peels off one broad petal for each hand of future bananas"; to find the magnificent staminate cone of *Cycas revoluta* in photograph 162 labeled ovulate.

Such small points will doubtless be corrected in the next edition, for this is a valuable and useful book which fills a need and could attract new talent to the ranks of botanists.

JENNIE L. S. SIMPSON
Hunter College
New York, N. Y.

BLAKESLEE: THE GENUS DATURA. Amos G. Avery, Sophie Satina, Jacob Rietsema. 289 pages, illustrated, indexed. The Ronald Press Company, New York. 1959. $8.75.

All geneticists and cytologists will appreciate a book of this type in which data from the 228 papers published in various periodicals by Dr. A. F. Blakeslee and his associates have been assembled and critically reviewed and evaluated. The volume is illustrated with 67 figures and contains 34 tables. The well-organized text is clear and concise. In a "Foreword," Dr. Edmund W.

Sinnott pays tribute to Dr. Blakeslee and describes this work as the "scientific biography of a notable man of science."

Following a historical review of the datura program, the taxonomy of the genus is presented. The chemistry, pharmacology, distribution, and biogenesis of the alkaloids of datura are treated in Chapter 3 by Edward Leete. The next six chapters are devoted to cytological investigations on chromosome number and morphology, polyploidy, extra chromosomal types, gene mutations, chimeras, and radiation effects. The last six chapters are concerned with sterility studies approached from morphological, physiological, and cytological directions. A fifteen-page index makes all information readily available to the reader.

No more fitting tribute could be made to Dr. Albert Francis Blakeslee than this volume on *Datura* which has been written by his co-workers. It is a job well done.

CLYDE CHANDLER
Boyce Thompson Institute for Plant Research, Inc.
Yonkers, New York

DEVELOPMENTAL CYTOLOGY. Dorothea Rudnick (Edited by). 215 pages, illustrated, indexed. The Ronald Press Company, New York. 1959. $7.00.

This volume contains nine contributions to the Sixteenth Symposium of the Society for the Study of Development and Growth held at Kingston, Rhode Island, in 1957. Cytological features of development are discussed in a wide variety of organisms ranging from the protozoa through plants to the higher mammals and man.

Modern viewpoints on chromosome and cytoplasmic structures are presented and much of this information is the result of research utilizing the latest techniques of cytology and cytochemistry.

The nine authors, J. R. Preer, C. R. Partanen, T. C. Hsu, G. and E. Klein, W. Beermann, H. F. Stich, D. von Wettstein, D. W. Fawcett, and A. L. Lehninger are authorities in their respective fields, and their articles contain, in addition to the results of their own research, competent and valuable reviews of the topics discussed.

This book will be of interest to all interested in the fundamental problems of biology.

CHARLES A. BERGER
Fordham University
New York, New York

101 BEST NATURE GAMES AND PROJECTS. Lillian and Godfrey Frankel. 128 pages, illustrated and indexed. Sterling Publishing Co., Inc., New York. 1959. $2.50.

This is a good book pal for Cub Scout or Brownie leaders. The projects are well defined and illustrated. The materials needed are not expensive and fairly easy to obtain. The text is written on a level easy for children to understand and assimilate without too much explanation.

Its content is very stimulating and invites the youngsters to pursue further on their own a particularly interesting subject.

The collection of games includes physical as well as mental exercises to hold the interest of a lively group of youngsters.

I recommend this book for garden club junior work, church groups, Cub Scouts and Brownies, particularly in the seven to eleven age groups. Some of the handcraft instructions are sketchy and should be worked out ahead of time by the leader.

MRS. SAM LASKER
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A REVIEW (from page 58)

are likely to promote an even balance and damp down the explosive power of outbreaks and new invasions." To obtain this fundamental knowledge of the functioning and stability of natural communities, we must study intensively our remaining wild areas, areas that have been termed "living museums of natural history" because of the wealth of forms and facts they contain.

The collection of examples and case histories of invasions to document and substantiate the conclusions made in this book has entailed considerable effort. Although the histories of animal invasions far outnumber those of plant invasions, plants have not been neglected. Prickly pear, ragwort, St. John's wort, rhododendrons, *Elodea*, diatoms, algae, and various other plants are considered. But one cannot help wonder why such a well-documented case as the spread of Russian thistle has been ignored, or why some of the stories of such ubiquitous weeds as the dandelion, common and English plantain, ox-eye daisy, chicory, lamb's quarters, purslane, chickweed, shepherd's purse, yarrow, mustard, and many others were not included. Among the insect invaders of North America, it is surprising to find no mention of the honey bee, Oriental roach, and other widely distributed forms. Each of these would have further strengthened the case presented by Dr. Elton and might have illustrated some of his points more vividly than the cases that were actually cited.

LETTERS TO THE EDITOR

I just have to tell you how very fine *The Garden Journal* is — the last issue was "tops" . . . The articles are so informative and such enjoyable reading. And I'm not the only one who thinks so, for each of the good gardeners to whom I give *The Garden Journal* have told me they look forward eagerly for the magazine.

. . . Thank you for being messenger to the Subscription Department, giving it the renewals which accompany this letter.

ELSA FORT
Merchantville, New Jersey

Your excellent magazine, November-December 1959, has just arrived. In Dr. Pirone's article on "Why Shade Trees Die Along City Streets," he shows examples of fungi which are apparently identical with those killing trees in my garden here. As these trees are several centuries old holly oaks (*Quercus ilex*), we are much perturbed and would like to hear what cure can be achieved.

The particular items disturbing us are apparently *Ganoderma lucidum* of which we had recently two magnificent effulgent examples, and on removing as much affected tissue as we could, we found what must be *Armillaria mellea* by the white wefts of tissue near the soil line. A third tree has a tiny white toadstool about one eighth inch diameter near the soil on the north side of the tree after a heavy recent rain.

This excellent article describes the disease, but not the cure. Is there any soil sterilizer we can use? . . . .

I shall be grateful for any information.

F. GORDON MORRILL
Florence, Italy

Dr. Pirone replied as follows:

Unfortunately cure is not possible for any of these, once the infection has become extensive. That is the reason why a cure was not mentioned in my article.

Insofar as the shoe string rot fungus, *Armillaria mellea*, is concerned, the Connecticut Agricultural Station, New Haven 4, Conn., says that soil can be disinfested of this fungus by drenching with one half pint of phenyl mercury acetate in one hundred gallons of water. From thirty to sixty days are required for the chemical to kill the fungus in the soil and in the diseased roots. Bear in mind, however, that this treatment cannot be used on living infected trees.

Bravo to "Country Housewife," Mrs. Foster, for her comments on some unfortunate nursery practices. I'd like to carry her ball a little further.

It is not unusual to see quite common plants advertised as "new" and "rare." *Albizzia julibrissin* and *Crossandra undulaeformis* are two subjects that have been so advertised during the past few years. The former is prolific nearly unto weediness in areas where it is hardy, and crossandra, according to Bailey's *Cyclopedia of Horticulture*, was described a century or more ago in *Curtis' Botanical Magazine* and the *Botanical Register*, and in *Revue Horticole* in 1891.

In 1954 I succumbed to a full-page color blurb of a Long Island outfit for a rare exotic, just discovered in China and now introduced for the first time. The subject proved to be lythrum 'Morden Pink,' so precious that it is listed as available at ten nurseries in the *Plant Buyer's Guide* (1949). The three "large" plants that I received for $2.98 were unrooted cuttings, and two were dead. I managed to root and later plant out the remaining one, and it stands in my garden as a reminder of caveat emptor.

I wrote a critical letter to the nursery and told them I was sending a copy to the newspaper. By return mail I received (a) a cheque from the nursery and (b) a letter from the paper registering dismay and vowing that it would never publish the advertisement of these horrendous rascals again. But there was a funny thing about both replies. In the case of (a) the amount of $2.98 was printed, not typed or put on with a check-writer, but printed on the cheque. Clearly, the refunding of exactly $2.98 was no new experience for this outfit. In the case of (b) the following year, and every year since, the same advertisement or one very much like it has been carried. One hopes the Long Island nursery has stocked up on a plentiful supply of pre-printed cheques.

Another thing that bothers me is the tender pampering of professional growers by state and federal government agencies. In 1952 I brought home from Guatemala and submitted to quarantine a number of cuttings, including one of a very large dianthus that I had found in a hotel garden. Soon a Department of Agriculture inspector came to my greenhouse and removed two cuttings. One was a passiflora, which could harbor a harmful insect, and the other was the dianthus. Had I insisted, he would have let me keep the former under conditions of periodic inspection, but he insisted on destroying the dianthus. Why? Because it was bigger than any other in this country and presented a threat to U. S. nurserymen! Apparently, protecting professional growers from competition is more vital than the possibility of a plague.

Every spring growers of very expensive pot-plants come to my fullsome but amateur greenhouse and depart with gifts of plants and cuttings, often new to the growers. They put in their pockets scribbled lists of things I'd like to have in exchange, and murmur promises. That's usually the end, until the following spring when back they come with the robins and as empty-handed. To be fair, there are exceptions—but they are exceptions. Having spent $30 for plants at a nearby greenhouse, I begged a tip-cutting of *Setcreasea purpurea*, Mr. Everett's colorful introduction. (I had given the man his start of the plant the previous year.) The favor was graciously granted, but another dollar added to my bill. Clearly, "payola" has not come to the petunia patch!

MARJORIE (MRS. KARL) WIHTOL
Middletown, New Jersey

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THE NEW YORK BOTANICAL GARDEN

V May - June, 1960

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

May 12, 1960. Spring Garden Tour to Princeton, New Jersey, sponsored by the Volunteer Associates of The New York Botanical Garden.

May 19, 1960. 11 a.m.-6 p.m. Seventh Annual House and Garden Tour for the benefit of the Patients Special Project Fund of the Institute of Physical Medicine and Rehabilitation of New York University-Bellevue Medical Center. For information on tour in Greenwich, Connecticut, and Purchase, New York, call OR 9-3200, Ext. 85.

May 21, 1960. Annual meeting of the American Rock Garden Society at White Hart Inn, Salisbury, Connecticut.

May 24, 1960. 2 p.m. Annual meeting of The New York Botanical Garden at the Garden. (Note change in date from May 16).

June 2, 1960. 10 a.m.-5 p.m. "Historic Morristown and Environs"—home and garden tour of The Garden Club of New Jersey. For tickets, write Mrs. Harry T. Maxwell, 47 Maple Avenue, Morristown, N. J.

June 7, 1960. Eighteenth Annual Rose Day at The New York Botanical Garden. Inspection of Rose Garden, with guest experts, 9:45-11:45 a.m. Afternoon Program, 1:00-3:30 p.m.; T. H. Everett, Assistant Director, (Horticulture) will be moderator of the panel of guest experts. Lunch may be had at the Snuff Mill Restaurant.

June 7, 8, 9, 1960. Ninth District of the Federated Garden Clubs of New York State, Inc., Flower Show School Course V at Memorial Methodist Church, White Plains, New York. For information write Mrs. Ronald W. Yocum, Spring Lane, Chappaqua, New York.

June 18, 1960. Rose Show of Southampton Garden Club at Parrish Memorial Hall, Herrick Road, Southampton, Long Island. Entries accepted from garden clubs and residents of eastern Long Island.

June 21, 1960. Reception for Graduates of the Two-Year Courses in Botany and Practical Gardening at The New York Botanical Garden.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, Mrs. Donald B. Straus, for the selection of the front cover illustration—the "Ladies' Border" at The New York Botanical Garden, process photography by E. N. Mitchell; pp. 87-90, F. C. Steward; p. 91, Boeing Airplane Co., Seattle; p. 92, 93, H. F. Becker; pp. 95-97, The Lawn Institute, Marysville, O.; p. 98, E. N. Mitchell; p. 101, lower left, Hilary Neighbors; p. 101, upper left and upper right, pp. 102-104, David G. Leach; pp. 105, 106, Albert Lowenfels; pp. 108-112, Howard W. Swift; p. 116, T. H. Everett; p. 117, E. N. Mitchell; p. 118, Jr. and Sr. High School, Cornwall, New York; p. 119, upper, Fay Photo Service, center, Paul E. Geneveux, lower, William Sevecke; p. 120, Edmund B. Gilchrist, Jr.; p. 121, upper, Standard Photo Service, lower, Armstrong Nurseries by Clint Bryant; p. 124, Robert Marshall. Drawings, pp. 99, 100, by Charles Clare, Jr. Diagram p. 106. E. C. Geiger, North Wales, Pa.

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AN APPRAISAL OF

PRESENT AND FUTURE TRENDS IN BOTANY

By William Campbell Steere

Excerpts from a paper presented by Dr. Steere, Director of The New York Botanical Garden, at a special symposium of the Botanical Society of America during the meetings of the American Institute of Biological Sciences at Indiana University, August 1958, and originally published in *Plant Science Bulletin*, Vol. 5, No. 3.

MY CONSIDERATION of present trends in botany, leading to some crystal-ball gazing into the future, has been rendered immeasurably easier by my close association with the series of special papers published in the *American Journal of Botany*. Celebrating the fiftieth anniversary of the Botanical Society of America, these papers, reinforced by three additional ones, appeared in book form under the title, *Fifty Years of Botany*. After living—and sleeping — with these papers for over two years, in reading each one in manuscript and in galley and page proofs, I have nearly committed to memory the views and ideas of the forty-some authors—which will explain my frequent reference to them.

The renaissance in taxonomy during the last decade or so—the "New Systematics"—has resulted from the transfusion into classical taxonomy of the data and the techniques of many other fields, as, for example, cytology, genetics, physiology, anatomy, ecology, experimental morphology, geography, biochemistry, and biophysics. Thanks to wise and generous aid from the National Science Foundation, as well as from other agencies, and the dynamic approach of outstanding systematists to their problems, systematic biology is in better health than it has been for decades. Much thought and attention have been given to the philosophical basis of systematic biology by some of the best biologists of the present generation — Anderson, Clausen, Dobzhansky, Huxley, Mayr, Simpson, and Stebbins, among others. . . . .

The very great importance of systematics in modern science has been emphasized recently by the "Report of the Committee on Systematic Biology of the American Institute of Biological Sciences" (1957). . . . Largely the work of the chairman, Ernst Mayr, this report states: "It should not be forgotten that the field of systematic biology continues to make important conceptual contributions to the field of biology as a whole. The great evolutionists, like Lamarck and Darwin, were practicing taxonomists and have themselves attributed their concepts to their background. One of the most important concepts in modern biology, that of the population, has grown out of the experience of practicing taxonomists. A healthy field of systematic biology is a necessity for the balanced development of biology as a whole."

Simpson (1945) summarized the situation very well, too, as follows: "Taxonomy is at the same time the most elementary and the most inclusive part of biology, most elementary because organisms cannot be discussed or treated in a scientific way until some taxonomy has been achieved, and most inclusive because taxonomy in its various guises and branches gathers together, utilizes, summarizes, and implements everything that is known about organisms, whether morphological, physiological, or ecological." The unifying force of systematics in the fields of botany and zoology gives it a transcendental importance as yet too little recognized. . . .

Like systematic botany, plant morphology has also experienced radical changes in its approaches and techniques. Eames (1958) presented an excellent résumé of the remarkable progress in the field of morphology during the past five decades. . . . The change in morphology from a rather narrow descriptive field fifty years ago to its present broad, interpretative, and comparative status is clearly depicted by him, as follows: "The development of comparative study produced new bases for interpretation: the recognition that sound morphology must deal with the entire plant body, with vegetative as well as reproductive parts, with internal as well as external structures; the recognition that simplicity may represent reduction from complexity as well as primitiveness; that parallel and convergent evolution have played an important part in evolutionary modification; that evidence of these changes is as often hidden as obvious and must be obtained from as many fields of research as possible—not from morphology alone, but from taxonomy, cytology, genetics, geography, paleobotany, serology, and other fields."

I have selected my quotations from Eames, Mayr, and Simpson especially carefully in order that each one might illustrate, and all might emphasize cumulatively, the only direction in which systematic and morphological botany can proceed successfully—through the use of all available data from every field of botany or biology, and through the development of broader research interests by individual investigators. . . .

. . .It is obvious that our better botanists, as well as our better taxonomists, must be versatile people with broad interests.

Ledyard Stebbins has reviewed the remarkable upheaval that took place recently in the classification of the grass family through new and significant data supplied by the microscopic anatomy of the leaf epidermis, the number and size of chromosomes, the comparative sensitivity to herbicides, the nature of the seed and its embryo, the development pattern of root hairs, the ecological requirements, and other characters of the plants ignored until recently. Needless to say, parallel investigations on other large and complex families will certainly result in equally revolutionary discoveries.

Edgar Anderson, in his inimitable style, has pointed out the necessity of developing logical basic procedures in those fields, such as taxonomy, where natural history, statistics, and applied mathematics may come together. Through his own brilliant invention, the pictorialized scatter diagram, we have a

relatively simple, precise, semi-graphical and semi-mathematical technique for dealing with multiple-sense-impression problems. . . .

Other and perhaps more familiar examples of the inter-relationships between morphology, taxonomy, and physiology are easy to find. The differences between populations — whether varieties, subspecies, or species—of all plants and animals are important not only in taxonomic terms, but also in the most fundamental biological terms. These differences are expressed by every single aspect of the organism, by its metabolism as well as by its structure. Physiological and biochemical differences are well illustrated by closely related poisonous and edible species of mushrooms in the same genus, by the different aromas and flavors of fruits of closely related species and cultivars of higher plants, and by the difference in color of flowers, not rarely controlled by genetic inheritance of some factors that determines the pH of cell sap. A fuller knowledge of the biochemistry of alkaloids, saponines, volatile oils, carbohydrates, latexes, anthocyanins, flavones, and other common plant compounds will eventually be of the utmost importance to taxonomists, especially within closely knit families and genera. It was no accident, for example, that systematic botanists were selected during World War II for the search for new and old sources of quinine, rubber, and other strategically important plant products in South America.

In the past, we have derived very considerable insight into phylogeny and evolutionary steps through rare and accidental abnormalities. A new approach now may be through artificially induced teratology, which can well open a whole new field of experimental taxonomy. The use of gibberellins to promote growth in plants that are genetically inhibited, and the use of herbicides to inhibit growth in plants that normally produce lush growth might very well expose hitherto hidden pathways of evolution.

As an administrator for many years in universities, in governmental agencies, and now in a botanical institution, I have become almost unduly sensitive on one question: What is the future of botany? Like all questions this one has two sides: What is the future of botany as such, and What is the future of botany in relation to—and in competition with—other sciences?

. . . The American Institute of Biological Sciences exerts a strong positive force for the identification and maintenance of biology as a united field, in competition with the physical sciences. The National Science Foundation, likewise, supports biology rather than botany, zoology, microbiology, or other biological fields. We must cancel all the long-standing feuds between the experimental and the descriptive biologists, between the physiologists and the taxonomists, between the botanists and the zoologists, and establish ourselves as biologists, or at least as plant scientists who are willing to work diligently and sincerely with others to build firm foundations under the flag of biology. . . . The great present strength of the two major fields of physical sciences, chemistry and physics, stems directly from their homogeneity, their integrity, and their avoidance of the suicidal fragmentation into special fields. . . .I shall make the prediction now that botanists will learn to pull together. . . .to protect the status and prestige of their discipline and to make forward progress as a group.

Equal in importance to the selection of the problem is the nature of the written report that presents the results of the research. . . .The charge leveled against them [morphologists and systematists] that their writings tend to be dull and prosaic has more than a modicum of truth, unfortunately. . . .Without doubt, the present-day high costs of publication and the consequent page limitations enforced by most botanical journals constitute one factor in the production of a near-neurosis in many authors who have developed a cold, sterile, telegraphic style that keeps the reader at arms' length, if not farther. . . .No author should feel apologetic for the occasional use of "I" and without being either verbose or chatty, and still more important without reducing accuracy, an author can by the subtle introduction of his own personality into his writing establish rapport with the reader and thereby stimulate interest. . . .Clear and emphatic writing will become increasingly necessary in a not distant future in which all papers reporting original research and ideas will be abstracted into electronic "memories." . . .

With the astonishingly rapid development of electronic devices for the storage and transmission of information, I predict that within a relatively short time much of the drudgery and housekeeping work of systematic botanists will be relegated to electronic computers. . . .

I predict that taxonomists will gain much insight into evolution and genetic fluctuations through the effects of controlled and accidental radiation. Taxonomists will certainly be called upon to identify plants that seem to indicate uranium-bearing rocks or soils—in fact, geobotany is already a well-established field. However, the recognition of plants that are unusually sensitive or unusually resistant to excessive radiation is still in the future. It will not be long before we shall need to know which plants may serve as indicators of accumulating fall-out dust and particles. . . .

I predict that privately and publicly supported botanical institutions will gain increasing momentum in basic systematic research. The immense prestige and influence of the Buitenzorg (now Bogor) Botanical Garden in Java for nearly a century as a source of morphological and taxonomic research materials is obvious from even a casual reference of the literature. The increased emphasis on botanical gardens in the last decade is encouraging, as through these institutions a broader base of public support of botany can be obtained. The brilliant success of the Los Angeles State and County Arboretum is the direct result of the guiding genius of Frits Went, for whom I can predict a still greater success at the Missouri Botanical Garden in St. Louis. George Avery has made a great public relations success for botany at the Brooklyn Botanic Garden, that reflects much to his personal credit. The Boyce Thompson Institute, The New York Botanical Garden, the Chicago Natural History Museum, the California Academy of Sciences, the great botanical gardens in London, Berlin, Paris, Copenhagen, Stockholm, Leningrad, and elsewhere in Europe, in Singapore, Borneo, Trinidad, Rio de Janeiro, Jamaica, West Africa, and elsewhere in the tropics are all important as primary loci for basic research or as sources for research material.

I predict the development of even larger and more accurately planned

(Continued on page 94)

CARROTS AND COCONUTS —
SOME INVESTIGATIONS ON GROWTH

By F. C. Steward

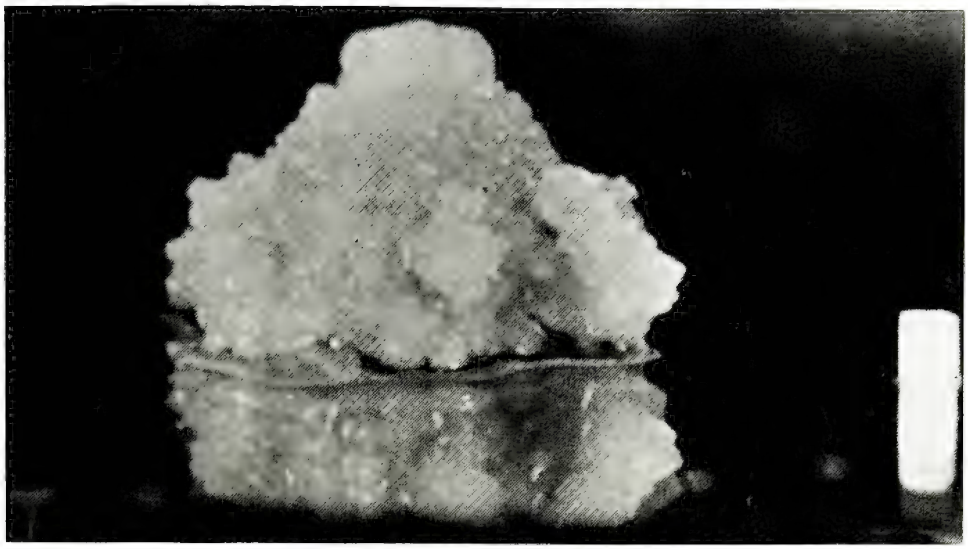


Fig. 1. Effect of coconut milk, added to a basal medium containing salts, sugars, and vitamins, on the growth of an explanted piece of carrot root tissue. Left, growth of tissue in presence of coconut milk; right, growth of tissue without coconut milk.

Dr. Steward has been Professor of Botany at the New York State College of Agriculture, Cornell University, Ithaca, New York, since 1950. Before that he was Chairman of the Department and Professor of Botany at the University of Rochester, Rochester, New York, and Lecturer at Leeds University and Reader at the University of London, England. He is a Fellow of the Royal Society of London.

The following is an abstract of the talk that Dr. Steward gave at the Fourteenth Annual Horticultural Congress in Rochester, New York, in October 1959. It is illustrated by reproductions of some of the slides accompanying his talk. The work has been supported by grants from the National Cancer Institute of the United States Public Health Service, and this account summarizes published and unpublished research in which a number of collaborators and technical assistants have participated, especially Drs. Caplin, Pollard, and Shantz, Miss Kathryn Mears, and Mrs. Marion O. Mapes.

IN ANY sexually reproduced organism the capacity to grow is "built into" the fertilized egg. In part this capacity to grow derives from the stimulus which follows the act of fertilization; in part it results from the special nutrition which the young embryo receives. These special nutrients may be supplied (in plants) by the often liquid contents of the embryo sac and of a special nutritive tissue known as endosperm. We need to know, therefore, the special stimuli which are supplied by these "nursing-organs" in plants which enable the embryos to develop.

The experimental materials that have been studied consist of living cells that would not normally divide again in the plant body, but in which, nevertheless, growth can be induced. These cells are found in the root of the carrot sufficiently far from the growing tissue (the cambium) so that in the normal way they would not divide again in the intact root. A series of events that need not be recounted led, some years ago, to the placing, aseptically, of pieces of carrot tissue in a nutrient medium complete with salts, sugars, and vitamins, but also supplemented with coconut milk. Coconut milk is the liquid endosperm of the coconut.

In the presence of the coconut milk the cells entered upon a very rapid, almost explosive, growth rate. In the absence of the coconut milk, though supplied with all ordinary nutrients, they grew very slowly, or not at all (Fig. 1). The interest of this observation is in the fact that the coconut milk, or liquid endosperm of the coconut, is the material that normally nourishes the immature

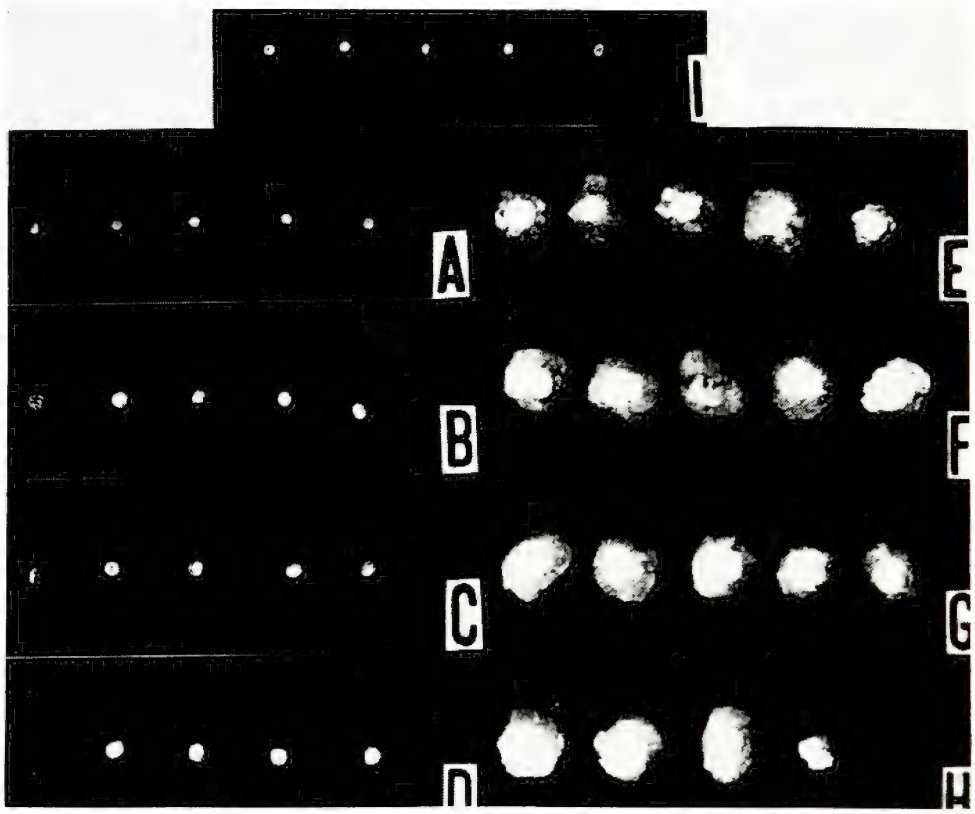


Fig. 2. Relative effects of indoleacetic acid and coconut milk on growth of carrot explants. I denotes initial size of explants; A to D, explants after growth on basal medium plus different concentrations of IAA; E to H, same with coconut milk added.

Fig. 3. Apparatus for the controlled growth of carrot tissue in liquid medium containing coconut milk. Lower wheels with culture tubes rotated 1 RPM; upper wheels with flasks for free cell cultures.

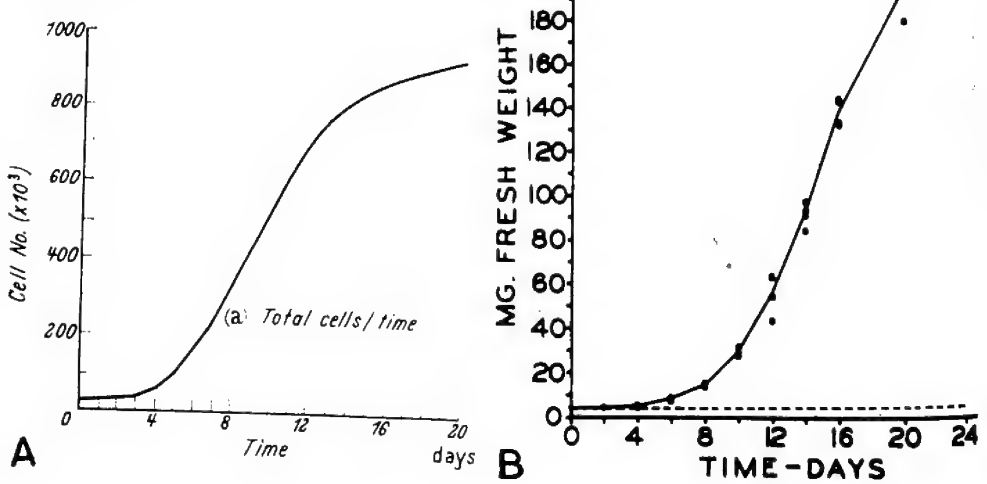
embryo of the coconut plant. Thus the liquid that normally nourishes an immature embryo contains materials that can restore to otherwise mature cells the rates of cell division that are characteristic of embryonic tissue. Full understanding of these stimuli should, therefore, contribute greatly to our understanding of the factors that induce growth by cell division.

It was first established that the materials responsible for this effect were not solely the then known auxin, that is, indoleacetic acid (Fig. 2). To study these effects, however, a technique had to be devised to permit quantitative data to be obtained (Fig. 3). Using such a technique for aseptic growth of standard explants[1] of carrot tissue in media with or without coconut milk, one can record the activity of the growth substances by the weight of the tissue. However, to distinguish between growth by cell division and growth by cell enlargement, precise data on the number of cells are needed, and for this a technique for macerating and counting the cells in a given piece of tissue must be employed. From the weight of the tissue and the number of the cells, their average weight, or volume, can be calculated. In following this procedure, it was found that a piece of initial carrot tissue weighing between two and three milligrams may grow in the presence of coconut milk to between two hundred and fifty to three hundred milligrams in twenty to twenty-one days, and in so doing, the twenty-five to twenty-eight thousand initial cells may have increased to between two and three million (Fig. 4). There is here, then, a very dramatic stimulus to growth by cell multiplication.

However, the full potentiality of the growth induction by coconut milk is not to be observed only by the growth of the unorganized tissue cultures that result from the stimulation of growth in isolated carrot explants. Again by a special technique that emerged during the course of this work, one can obtain from the growing tissue cultures of carrot freely suspended carrot cells which grow and divide in the liquid medium. Incidentally, this has also been done for cells of the potato tuber and peanut cotyledon. However, it is remarkable that the freely suspended cells multiply in ways that would not be readily recognized from their behavior in the intact plant body; and, moreover, their growth can be continued until they form clumps of cells and until differentiation begins within the clump. Although the carrot explant rarely, if ever, forms roots, the isolated pieces of tissue grown from cells do form roots very readily and, if transferred to a semi-solid medium, they will also initiate shoots and eventually produce whole plants. Even the completely differentiated living cells of explants from the carrot root still retain the full potentiality to produce the whole plant body. Indeed, the long awaited ability to rear whole flowering plants from single cells seems now to have been achieved (Fig. 5). However, when the events are traced in detail, it is seen that en route to the whole plant minute pro-embryo-like structures are formed, so that the coconut milk, or nutrient medium for the immature embryo, has super-imposed on the otherwise vegetative cells of the carrot much of the behavior that is normally associated with the embryo itself. This raises the question how much of the behavior of the egg in the ovule is due to its special *nurture* in this curious "nursing-organ."

It is not to be expected that these responses are confined to carrot cells on the one hand and coconut milk on the other. Other sources of the effect here associated with coconut milk have been found in the immature grains of corn, that is, corn in the milk stage; the most useful source in a broad-leaved plant has been the immature fruits of the

Fig. 4. Curves showing time course of growth of explanted carrot root tissue. A, growth in terms of thousands of cells per explant. B, growth in terms of mgms. weight per explant.



1. Tissue taken from a plant and grown in a culture medium for the purpose of study.

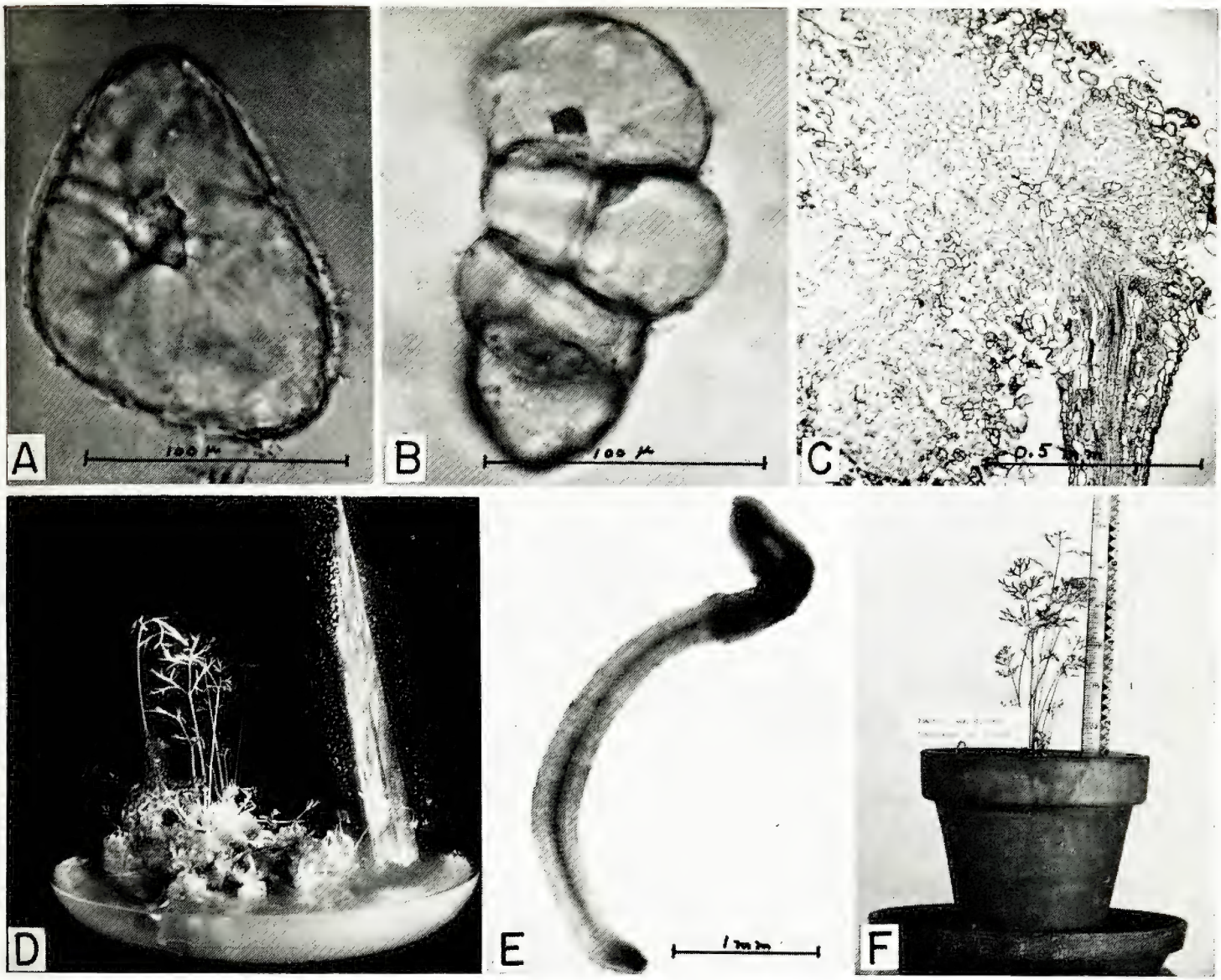


Fig. 5. Course of development from free cells to whole carrot plants: A = freely suspended carrot cell in liquid medium. B = similar cell after divisions in two planes at right angles. C = proliferated mass of cells showing a root emerging from a "nodule" or "center of growth" formed in the mass. D = young shoot emerging from the mass of cells grown on agar after transfer from liquid medium inoculated with free cells. E = young plantlet — teased out from D — showing embryo-like form. F = carrot plant which originated in the manner shown in A to E.

horse-chestnut. Although these different materials produce equivalent effects, they seem to do so by chemical substances that are not exactly identical. Even during normal development, certain stimuli of the kind here in question sometimes result in spontaneous cell division. Some plants by-pass the normal sexual process, because individual cells give rise to embryos without fertilization—the phenomenon commonly known as apomixis. In some plants, the stimuli to the development of fleshy fruits, which is often associated with the presence of an embryo, may occur even in non-seeded plants—this is the case in the edible banana. Often, also, plants spontaneously form tumors—this is true of certain hybrids of the tobacco plant. All these situations probably have something in common. It is known that an extract of the region that normally produces the fleshy edible portion of the banana will also make carrot cells grow; and it has been found that the strains of tobacco that form tumors spontaneously contain an excess of the cell division-promoting substances or stimuli. Plant tumors induced by the crown gall organism are also found to be rich in materials that will stimulate the growth of the carrot cells in the manner described. Thus the normal growth of cells by division may generally be controlled by a delicate chemical balance of growth promoters on the one hand and growth inhibitors on the other. Many chemical substances are now known which can act as inhibitors of the coconut milk growth stimulus, and indeed many organs which cease their growth by cell division, for example such storage organs as the potato tuber, yield evidence of these anti-growth substances for which the carrot-coconut milk system provides an assay system. The buds of trees pass through a period of activity when they are initially formed, then enter upon a period of rest and dormancy from which they eventually emerge; the control of this activity seems to lie in a similar type of mechanism. Some time ago (and here in Rochester) extracts were made from buds of maple in the late summer and early fall, and it was found that these extracts could suppress the growth of carrot explants in a medium containing coconut milk. This effect persisted until, after due exposure to cold, the buds emerged from their rest period, when

this growth inhibitory effect disappeared. The control of the machinery of rest and dormancy has, therefore, a somewhat similar basis in the control of growth by cell division or its suppression by appropriate inhibitors. When a tumor forms in plants, as in animals, unregulated cell division obtains; and one can readily see the parallel between the random, runaway growth that is caused by the effect of the coconut milk on the carrot explants and the inception of growth that may result in a cancerous type of tissue.

For all these reasons, great interest attaches to the chemical nature of the substances present in coconut milk, in corn extract, and in *Aesculus* (horsechestnut) extract, that give rise to the effects here in question. It would take too long to describe the work of many years in which several investigators have been concerned. Briefly, the present position is as follows.

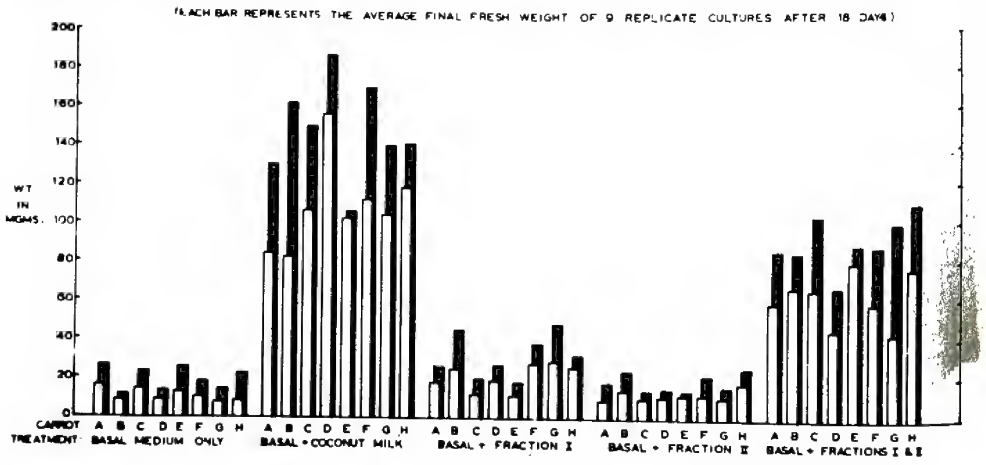
No single substance unlocks the door of cell division. There are obviously many substances that achieve these ends by different routes. Moreover, they appear not to act in isolation but to form part of a complex growth-promoting system. In the coconut milk, large amounts of which have been fractionated, there are at least three main portions to be considered. The first is a relatively non-specific source of organic nitrogen, for the cells use reduced nitrogen more readily than nitrate. For this portion of the coconut milk effect, casein hydrolysate can be substituted or a variety of known amino acids or nitrogen compounds. The more specific part of the coconut milk effect, however, is now known to be divisible into two broad fractions. One of these contains mostly substances that are chemically neutral, and for this reason is called the "neutral" fraction. While sugars are present in this fraction, the effect in question is over and above the nutritive effect of the sugars. By the work of Drs. Pollard and Shantz, it is now known that this fraction owes its main effect to sugar alcohols and cyclic hexitols, known as inositols. Three such substances have been isolated in crystalline form and critically identified. One of these is the sugar alcohol sorbitol, which is a main constituent of coconut milk; and two inositols known as *myo*-inositol and *scyllo*-inositol have been obtained. These substances do not themselves incite cell division, but unless they are present in the medium in the appropriate quantity, the cell division-promoting substances proper cannot act (Fig. 6). These growth-promoting substances that act specifically upon cell division do so at very great dilution, of the order of a few parts per million in the medium; and these together comprise what is now called the "active" fraction. It is abundantly clear that there are many such substances even in the active fraction. Some time ago, in work started at Rochester, three such substances, termed Compounds A, B, and C, were isolated and purified, and the identity of two of these seems to be clear. One is the substance diphenylurea, and the other may be xanthine. However, we now know that the first methods used to obtain these cell division-promoting substances suffered, because we were not then aware of the synergistic interaction with the so-called "neutral" fraction; and we know quite definitely that there are other substances in the coconut milk than those originally termed Compounds A, B, and C that promote cell division. Profiting by all this, a large isolation is now in progress in the tropics, using some two to three thousand gallons of coconut milk, and the expectation is that from this isolation the final answers will emerge.

However, from the analysis of large amounts of corn extract, quite different cell division-promoting substances have been obtained; amongst these is a new indoleacetic-acid-arabinose complex, the full structure of which is not yet known. From the *Aesculus* extract, purified leucoanthocyanins have been obtained, which similarly promote growth by cell division and this class of substance seems to be present in all the endosperms examined, particularly in the more solid portions of the endosperm or in the integument which often nourishes the growing embryo. Some four crystalline substances were isolated from the *Aesculus* fruit, particularly from the liquid portion of it, and one of these turns out to be either chlorogenic acid or a substance very closely related to it. Therefore, there is no simple common denominator between the various substances that have been found to stimulate growth by cell division, and this at present is the status of this field work.

Consequently, the primary process of growth by cell division is not alone stimulated by nutrients, but over and above this are chemical regulatory effects which act first upon the process of cell multiplication. The over-all system that controls the ability of plant cells to utilize their nutrients and to canalize their effect into growth by cell division is complex. It involves many substances of diverse nature, which interact to produce the effect in question. The full identification of all the substances that participate in these effects is a prime task for the plant physiologist, and it underlies the interpretation of all growth and development. When it is known how these effects work in the normal nutrition of the growing point, it may be possible to understand how the effect of such stimuli as those of length of day and night temperature upon processes of growth and development are mediated; here also there must

(Continued on page 94)

Fig. 6. Growth response of 3 mgm. tissue explants from eight different carrot roots to whole coconut milk and to coconut milk fractions I (active fraction) and II (neutral fraction) separately and in combination, in basal medium (white bars) and in basal medium + 0.025% casein hydrolysate (solid bars).



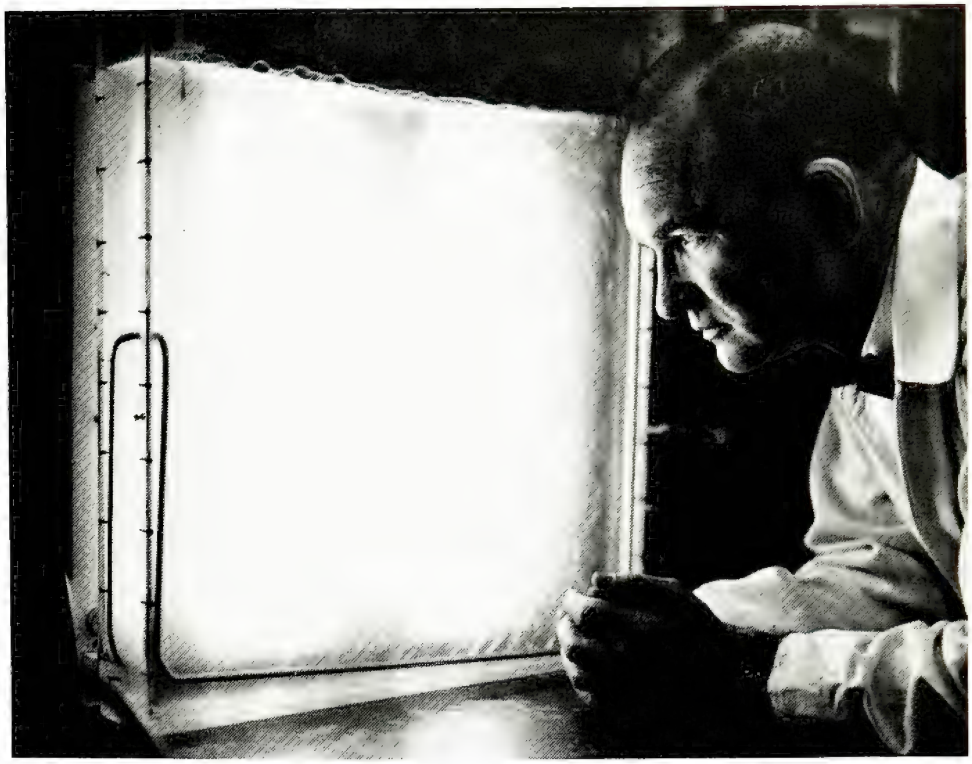
AN OUTER SPACE GARDEN

By Samuel J. Johnson

Boeing scientists, studying how a man may be kept alive in space, are faced with an immutable fact: a man must eat, he must have air to breathe whether he stays out of the atmosphere minutes or longer, and in space travel he must have these things within a vehicle small and light enough to be propelled out of the earth's atmosphere and gravity belt.

The answer sought by these scientists is a closed ecological system in which water, oxygen, and foodstuffs can complete the whole natural cycle in limited space and fairly fast time.

The author of the following article, Dr. Samuel P. Johnson, is Senior Plant Physiologist in the Space Medicine Section of the Aero-Space Division of Boeing Airplane Company, Seattle, Washington. Dr. Johnson was formerly associate professor of plant physiology of the Texas Agricultural and Mechanical College System at College Station, Texas.



Dr. Samuel P. Johnson inspects a tank of algae in one of the experimental units of the Biosciences Section of the Boeing Airplane Company. The density of the algae is quite low; otherwise, the light would not go through.

IN THE EARLY STAGES of space exploration, short-term space probes require only that the crew be fed from the condensed rations familiar to everyone who has served with the armed forces. Oxygen for breathing and drinking water will be supplied as needed from stores.

As the duration of the flight increases into months, a weight concession must be made — liquid human waste must be converted into potable water.

For flights beyond six months duration, the remaining human waste must be recovered and recombined into edible food and oxygen.

Since the processing of human waste into useful products by purely chemical means involves too great a weight penalty, the engineers of outer space turned to plants in their search for a solution to this problem. Photosynthesis, the plant process known to all of us, is about three times more efficient than the chemical plant of industry in converting human waste into edible food and oxygen.

The system, which is called a closed ecological system in space terminology, involves a plant or plants to furnish food and oxygen to the crew. The plant derives its nutrients, water, and carbon dioxide from a human waste converter system.

The plant selected to accompany the crew into space is the alga chlorella, a microscopic, single-celled plant that is relatively easy to grow in aerated liquid. Chlorella does not reproduce sexually but remains in the vegetative state.

The food production of chlorella is very high on a unit-volume basis. Although several hundred liters of alga suspension are required to furnish food and oxygen for one man at present, it is expected that as soon as alga culture attains the fine precision of modern

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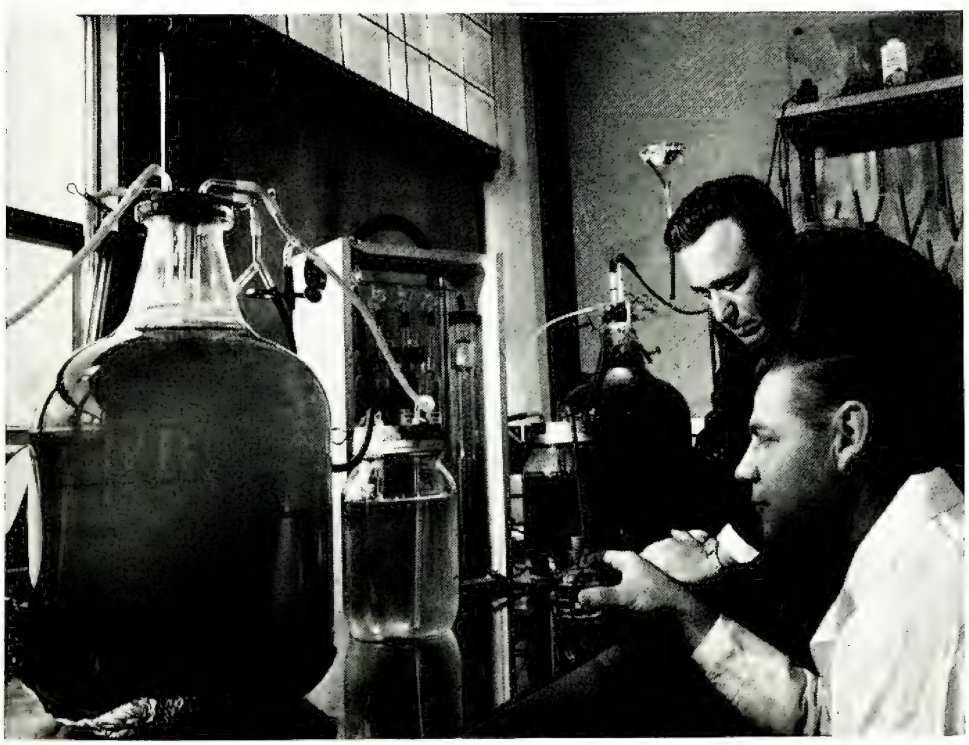


Dr. Joseph Stern, in back, Biochemistry Unit Chief in the Space Medicine Branch of Boeing's Systems Management Office, and Dr. Albert K. Sparks of the College of Fisheries, University of Washington, note progress in an experiment to grow the tropical fish, *Tilapia*, in small jar at center, on algae growing in large jar at left. Algae grow on carbon dioxide and human waste, thus providing a possible answer to waste-disposal problem in space travel.

BIRD TAMING IN MONTANA

The Story of "Trouble" and "Greedy"

By **Herman F. Becker**

Dr. Becker is Visiting Research Associate at The New York Botanical Garden.

ONE OF MY rarely admitted passions, fed by nostalgic memories of childhood and since confined to a latent, but constantly glowing desire, is to gain the confidence of birds, wild and free. Suddenly, during the summer of 1959, these haunting, permanently recurring memories burst into reality during my season's stay in the upper Ruby River basin in southwestern Montana. Though I had not tried my hand at taming birds for the past forty years, I knew that I would succeed by employing the same time-proven methods that worked so well in the rolling, Pennsylvania-like region of the Saar Valley. There I was rarely without a pet blue jay, crow, or jackdaw. These birds, raised from infancy, remained with me — some for years—as constant companions through woods and field.

In my capacity as palaeobotanist I have had the opportunity during many field seasons to collect plant and insect fossils in the Ruby area, a rugged and mountainous terrain with sprawling benches that gradually descend to the river. The region is sparsely inhabited, vegetation and climate are semi-desert; an ideal place for magpies, falcons, hawks, and owls. Mice, packrats, chipmunks, rabbits, and rattlesnakes provide abundant food for many of these birds.

A previous, fortuitous experience with an adult horned owl that I found unconscious on the road and nursed back to life, taught me to be completely unafraid (if cautious) even of birds of prey. I now take it for granted that this feeling is mutual, if constant protection and proper and ample food are provided. For two weeks the owl remained at the camp site on a perch in a hollow tree, demanded food, and simply refused to leave. In order to get rid of it, I had to drive some miles away from camp and shoo it into the night.

In the cottonwoods along the Ruby River and in the barren drywashes of the benches, there are hundreds of noisy magpies and a score of red-tailed hawks. One day late in June my attention was drawn to noises and activity in a dense juniper tree near our fossil outcrops. To my surprise I found a lone, half-naked, half-starved, and maggot-infested magpie, about ten days old. The young bird was taken from the huge and obviously deserted nest, brought to the camp, and placed in an open, sage-and-cotton-lined box. After several maggots had been removed from the ear openings, the orphan was given bread soaked in water, hard-boiled egg, and bits of chopped meat. Although force-feeding was necessary for two days, the young bird, later called "Trouble," demanded food from the third day on with loud and screeching noises every time someone approached. Trouble grew rapidly and soon began hopping around the camp site, pecking at pebbles, sticks, and ants, tearing the labels from tin cans, falling into the dish water, and jumping into a plate of hot soup. His mischievous curiosity got him into the most ridiculous situations and demanded "controlled" patience, a sort of "grin and bear it." His rapidly developing plumage of white and shiny blue-black and his extremely long, bobbing tail soon turned him into a formidable fledgeling. Disregarding all sanitary rules, Trouble now flew from one head to another, insisted upon sitting on and pecking at our hands or tools, toothpaste or shaving cream, or taking a bath in the cooking pot. Thus Trouble helped us with our work; and when he was out of sight there was no doubt where he had been, for he was generous with his calling cards. He began to accompany us on our daily forays, but

Dr. Herman F. Becker holds the young hawk, with down-covered, drooping wings, the day it was taken from the nest.

One month of loving care transforms the nestling into an alert, if shaggy pet.

Innocent "Trouble" eyes the suspicious hawk for possible mischievous action.

"Calm before the storm." "Watch out, here I come!" Does the magpie know that the hawk cannot yet balance on one foot and thus is unable to use its talons for defense?

never strayed far away from us and food. By then he had learned to relish grasshoppers, beetles, ants, butterflies, and raw meat, as well as almost any kind of canned food including sardines, soft drinks, coffee, and fruit. His favorite pastime, however, was to sneak into the roomy tent to cause general havoc. Stamps, letters, tissues, coins, razor blades, rattlesnake rattles, and countless other items were stolen, ripped to shreds, tucked into the folds of blankets. Not a square foot was spared his indiscriminate wreckage. When I was working and reading in the tent at night—I had finally taught him not to use my head as a nest—he reluctantly perched on my shoulder and fell asleep. Trouble's ability to learn seemed remarkable. Only once did he dip his beak into hot coffee, and on another occasion peck at embers in the fireplace, never again!

After six weeks, keen-eyed and almost fully grown, the hawk approaches the plumage pattern of its parents. Now its wingspan is three feet.

When Trouble was about three weeks old, I discovered the nest of a red-tailed hawk in a tall, dense willow thicket near Mormon Creek. The parents were lazily soaring in graceful circles, high against the blue morning sky. The thought came to me suddenly —and was too much challenge to be passed up. Soon I was swaying twenty feet off the ground, faced with a huge nest built of interwoven sticks and branches. Three young hawks were momentarily standing on their feet, staring intently, and awkwardly flapping their enormous, narrow wings. Somewhat uneasy about the possible intervention of the nearby parents, I took the nearest bird, cradled it in my jacket, and cautiously descended. The little bird never showed any sign of defense or fear. An abandoned magpie nest, placed under the awning of the tent, served as its new home.

The young hawk, with a wingspan of fifteen inches, and not more than two weeks old, also had to be cleaned of maggots in the ear openings and around the neck, where blood from previous feedings had soaked and matted its soft, gray down. After the first force-feeding of hard-boiled egg, food was taken greedily everytime it was offered. Mice, chipmunks (skin and bones), rabbit meat, and beef were substituted for soaked bread and egg which he soon refused. "Greedy's" growth was commensurate with his phenomenal, insatiable appetite of, for example, an entire hindleg of rabbit at one sitting, or half of a three-foot rattlesnake, skinned and cut into two-inch pieces. The hawk never took water or any other liquid.

We learned from Greedy that hawks keep their nest clean from the earliest age. When the time arrives, and that is quite often, they creep to the edge of the nest, turn around, go through curious adjusting movements and forcefully eject — over the rim, sometimes three to four feet in a horizontal line.

The happy "Trio" just prior to their separation.

As Greedy grew, he wandered around the camp site very much like a chicken, pecking here and there. He would particularly respond to a high-pitched whistle through the teeth, or a cry similar to that of adult hawks when they are soaring. Greedy, just like Trouble, was completely tame, attached, and displayed obvious pleasure at having his head and back scratched. His dignity of movement and behaviour contrasted sharply with that of the "urchin," Trouble.

The relationship between these two was one of watchful distrust and obvious jealousy on the part of the magpie. Trouble would cautiously, and as though innocently, sneak up, then with lightning speed peck at Greedy's feet or jump on his back to belabor his head. At feeding time he tried to snatch every morsel that the hawk was about to devour. But one day, magpie feathers flew. Trouble had learned yet another lesson. He looked sad, indeed, without a tail.

In August, three days before my departure, the hawk made his first attempt to fly. I left him—in full plumage and with a three-foot wingspread—in the care of a game warden; I learned later that he departed in October for the nearby mountains. Trouble also joined a flock of his own at about the same time.

I do not advocate the taming of wild birds unless one possesses a thorough knowledge of their life and feeding habits, and unless a suitable environment, similar to their natural habitat, is provided. One should never attempt to confine such birds to a small enclosure, but allow complete freedom of movement; never hold them forcefully; never retaliate when they peck or scratch (even if it hurts), but make them realize that hands and fingers are "friends" that feed them instead of instruments of torture. And one should speak softly and avoid sudden motions. Greedy, with his enormous beak and talons, and Trouble, with his shrill noisiness or soft, imitating cooing, have given me unforgettable pleasure and companionship in a generally barren land. It is well-nigh impossible to put into words the feeling of elation that arises from being accepted as a trusted friend by birds of prey in their world of Nature, where Man is but the common enemy.

TRENDS IN BOTANY (from page 86)

phytotrons, after the pioneer developments of Frits Went. With these facilities that may duplicate all the climates of the world, experimental ecologists, taxonomists, morphologists, and physiologists can test the innate variability and nature of plant materials.

I predict that paleobotany, through the development of more refined techniques and the exploration of new and rich deposits, will reveal plant materials perfectly fascinating to morphologists, systematists, and geologists. The field of micropaleontology is in especial need of expansion by botanists.

Although exploited and unfortunately somewhat discredited more than forty years ago, the field of serum diagnosis, for determining the degree of relationship of organisms and groups of organisms, is entering a new phase, in which the results are more important than the justification of the techniques. Through varied biochemical and biophysical techniques, ranging from chromatography to electrophoresis, the proteins and sera of plants and animals are being studied and compared at an ever increasing rate. I predict positive and enlightening results from these techniques that can be almost immediately applied to the solution of some of our numerous and perplexing problems of plant phylogeny.

Although almost a stepchild of botany a generation ago, ecology has come of age and is now a welcome and important member of the family. Among the most significant contributions of ecology, in my estimation, was Chaney's application of the philosophy of associations to paleobotany, thereby clarifying the identification of many previously unknown members of several geological horizons. The detailed studies of plant associations in the Brazilian rain-forest by Cain and his co-workers in *Fifty Years of Botany*, will long remain a classic of its kind.

I foresee that many relatively or totally new phenomena will receive study by botanists. Carbon-14 is a magnificent indicator of the past, and through its determination, accurate estimates can be made of plant migrations and post-Pleistocene plant history. The ecological and phytogeographic significance of this technique has hardly been touched.

Permafrost, or permanently frozen ground, is a little known, little recognized phenomenon of arctic regions, little studied by botanists, yet has a pervasive influence on the distribution of plants and animals. I predict a much greater emphasis in botanical research on the implications of permafrost, especially in view of our uneasy but inevitable preoccupation with northern regions.

One of the bright spots in the future of the various areas of systematic botany, plant morphology, phytogeography, ecology, paleobotany, is the valiant effort of the National Science Foundation to support basic research. While plant physiology, biochemistry, and genetics derive support from a dozen or more private and governmental agencies, the so-called "descriptive" areas remain without adequate support, illustrating too well the fact that even within the boundaries of science one may find "have" and "have-not" fields. The prospect of ever increasing financial support for research of a basic nature in our "have-not" areas is encouraging, indeed.

I conclude that the future of botany is very bright. If you think I say this in any offhand or casual manner, I must remind you that I have recently dedicated the remainder of my professional life to what I consider to be the best interests of botany, and with the intention of devoting my full energies to the field. Only history will supply a brief footnote on the wisdom of my decision!

CARROTS AND COCONUTS (from page 90)

be a chemical link between the effect of the environment on the one hand and the growth on the other. As in dormancy, the chemical trigger may operate through the control of cell division and cell enlargement, utilizing a system similar to that which can be detected through the interacting effects of "carrots and coconuts."

WEEDING LAWNS

By Robert W. Schery

Dr. Schery is Director of The Lawn Institute, Marysville, Ohio.

PLANTS HAVE EVOLVED which will grow on almost any soil, short of those that are chemically poisoned or absolutely without water. Consequently, there will always be weeds; that is, there will always be unwanted plants cropping up, if wanted plants do not already fill the space. Of course, any plants you do not want growing in the lawn are weeds there. These "weeds" may even be planted grasses (but those that you do not favor), or a legume such as clover, a component of some lawn seed mixtures.

The point, however, is not to define what a weed is, but to illustrate that weeding is a part of the whole lawn-maintenance program. Any time that turf-grass fails, for whatever cause, weeds are sure to be a problem. And any time you clean out the weeds, by whatever method, the respite will be temporary unless you are able to correct the conditions that kept the grass from growing well in the first place. Thus, paradoxical as it may seem, the first step in weed control might not be digging the dastards out or applying potent weed-killers, but sowing the proper seed or fertilizing grass at the right season.

Spot treatment for selective removal of dandelions being carried out with a 2,4-D type chemical.

For the northern two-thirds of the nation, the best lawn guardians are the bluegrasses and red fescue varieties, since they flourish in many situations. Fertilizing these grasses generously in autumn, the season in which they build reserves for a good start the following year (and the season when most lawn weeds retire, too) is a big step towards crowding out spring weeds before they even begin. A second big step is setting the mower high (as high as three inches in southern portions of the bluegrass belt; one and one half inches may be sufficient in the North). High mowing strengthens the grass and enables it to shade and crowd weeds.

The third step is emergency treatment, to eliminate weeds that have gained a foothold. It is sometimes possible (on established turf) to "immunize" the soil chemically against the sprouting of annual weed seeds, crabgrass especially. The treatments seldom last for more than a season; but if weeds are prevented even one year, less seed is set for future years. The soil will seldom be completely free from weed seeds; seeds of crabgrass and other species may lie dormant for years, only to sprout when churned to the surface by winter frosts, or when the established turf is accidentally scuffed thin. Harmful weeds are almost never introduced into the lawn from reliable brands of seed mixtures, assiduously checked as they are.

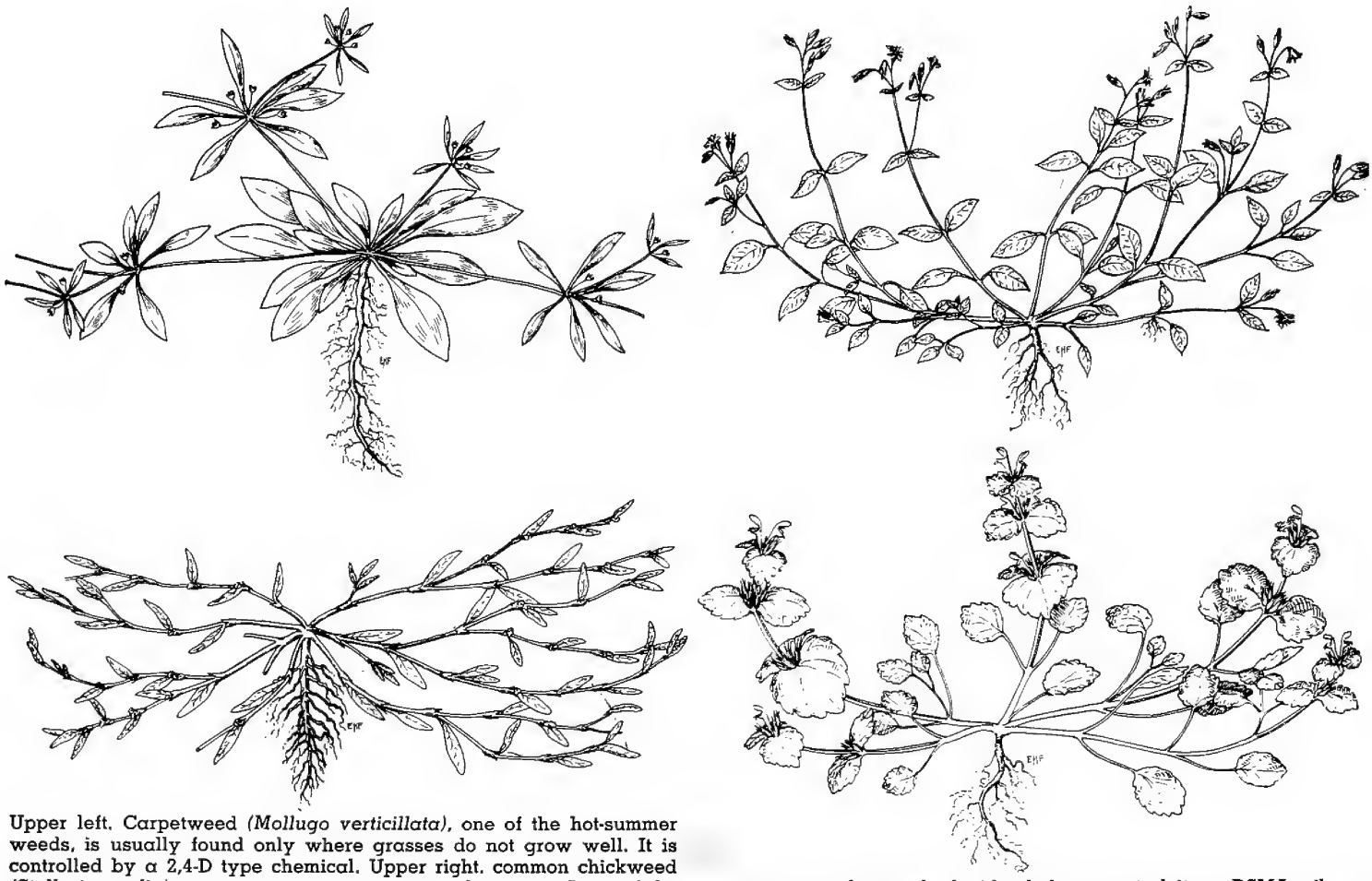
This is one of the inexpensive automatic sprays for weed control; it can be used in controlling crabgrass.

Chemical weed treatment has become a complicated science in itself. Each year numerous papers are presented at conventions, reams of articles are written, and hosts of new chemical combinations are offered for experimentation. But instead of speculating on the future, let us look at the chemicals widely marketed for weed control today. There are two main categories: (1) the 2,4-D family of herbicides, primarily used for elimination of broad-leaved weeds or dicotyledons (dandelions, plantains, chickweeds, spurge, and so on); and (2) the mixed assortment of chemicals primarily used for selective elimination of annual grasses in established turf (crabgrass especially, but also foxtail, goosegrass, and even some of the annual dicots such as chickweed).

BROADLEAF WEED KILLERS. About the time of World War II, 2,4-D (2,4 dichlorophenoxyacetic acid) was developed at Boyce Thompson Institute for Plant Research. This was an outgrowth of study on growth-regulating compounds; it was discovered that at certain concentrations this particular compound almost miraculously causes certain species to die while it does not affect others. Grasses are especially immune. Consequently, use of 2,4-D as a lawn-weeding chemical was almost inevitable.

Since the first 2,4-D acid was marketed, chemists have introduced a long series of salts, esters, and amine formulations, so that there are today less volatile forms, not quite so hazardous around the home, and forms for more specific employment. Changes in the molecule have yielded 2,4,5-T and 2,4,5-TP (silvex). These kill certain additional species that were resistant to 2,4-D itself. Most general weed-control

This automatic spray appratus is being used for general weed control in the summer on bluegrass in Ohio.



Upper left. Carpetweed *(Mollugo verticillata)*, one of the hot-summer weeds, is usually found only where grasses do not grow well. It is controlled by a 2,4-D type chemical. Upper right. common chickweed *(Stellaria media)* sprouts in autumn or very early spring. Some of the pre-emergent crabgrass herbicides help to control it; or DSMA, silvex, neburon, and so on, can be applied early in the spring. Lower left. Knotweed *(Polygonum aviculare)* is especially frequent on compacted soil where grass grows poorly. This trailing culprit is hard to kill, but succumbs to a 2,4-D type chemical early in the season. Lower right. Henbit *(Lamium amplexicaule)* is a little difficult to eradicate, partly because it thrives in cool weather when herbicides are less effective. Repeated applications of silvex or 2,4-D should do the job.

chemicals are based upon the 2,4-D-type chemicals, singly or in mixture (a silvex—2,4-D mixture is being widely marketed this year). Used carefully and according to directions, these remove drudgery from weeding.

Almost invariably such herbicides are most effective when weeds are growing vigorously, as in warm weather after rain. They are more lethal to younger weeds than to older (spurge, *Euphorbia*, and knotweed, *Polygonum aviculare*, are especially resistant when mature). The familiar northern lawn grasses, especially bluegrass, *Poa pratensis*, and the lawn fescues, *Festuca rubra* in variety, are quite tolerant of 2,4-D weed sprays. Caution is advised in exceptionally hot weather, and when the compound is mixed with fertilizer or other materials. But if directions are followed carefully, 2,4-D nowadays makes merry of what was a formidable task.

ANNUAL GRASS HERBICIDES. The attack on annual grasses, crabgrass especially, has yielded such a variety of useful chemicals that it is hard to generalize. Basically there are two chemical approaches to crabgrass elimination: (1) soil treatment, to kill seedlings as the seeds sprout (pre-emergence treatment), and (2) application to growing weeds (post-emergence). Pre-emergence treatment is the more recent development, and the technique is being heavily promoted this year. It is likely to be somewhat more expensive than post-emergence control. Pre-emergence treatment must be made before weed seeds sprout, preferably in early spring, or even in the preceding autumn. The lawn is blanketed with the chemical, which acts through the soil on sprouting seed but does not harm the older, established grass. Carefully applied, the treatment is at least ninety per cent effective.

FOR SPROUTING WEEDS. Four pre-emergence chemicals have achieved widespread recognition for crabgrass control; to a greater or lesser extent they inhibit any sprouting seed. Long used for grub-proofing, arsenic compounds (lead arsenate, calcium arsenate, or arsenical mixtures) have been shown to inhibit crabgrass at rates of from fifteen to twenty-five pounds to the thousand square feet. A familiar insecticide, turned herbicide at heavier dosages, is chlordane (recommended at one and a half pounds of active ingredient per thousand square feet). Two very effective newer compounds are zytron (Dow Chemical) and dacthal (Diamond Alkali), both of which are effective at rates even lighter than those recommended for chlordane.

These chemicals show up as active ingredients in an array of brand products, each of which is formulated to the manufacturer's liking; since formulations differ, it is imperative to follow application directions on the package exactly. Dry granular products or liquid sprays seem to be about equally effective. The effectiveness lasts from a few weeks up to an entire year, depending upon chemical, soil and weather. In the following years a booster application with some, or a repeat treatment, may be advisable (see directions on package).

FOR GROWING WEEDS. Chemical substances for killing growing crabgrass have had many more years of trial than have the pre-emergents. Arsenites were first recommended, but proved poorly selective, burning the grass as well as the weeds. Potassium cyanate was an improvement, but still tended to burn the turf when used at high enough concentrations. The phenyl mercuries were somewhat more selective than potassium cyanate, but needed three or four repeat applications, and in some areas did not work well.

Leading the parade today are the methyl arsonates (DSMA, AMA) which give satisfactory control in two applications about a week apart; both dry and spray formulations are available. The treatment is, on the whole, more economical than pre-emergence treatment. Early summer would be the logical time to go after crabgrass, before this weed starts setting seed heads. If there is doubt whether a weed is crabgrass, a specimen can be sent for identification to a nearby botanical garden or experiment station, or to a commercial concern that deals in lawn products. The arsonates will not bother coarse perennial grasses, which some home owners mistake for crabgrass.

Arsonates have also killed some broad-leaved weeds resistant to 2,4-D (mouse-ear chickweed, for example); such pests as dallisgrass in the upper South; and annual companions of crabgrass, such as goosegrass and foxtail. As a matter of fact, arsonate mixed with 2,4-D is a pretty lethal weed-killer for practically anything that crops up in the lawn. But do be careful with any herbicide; uniform application at rates recommended for the product is essential, since a little too much can set back the grass.

Cress *(Lepidium campestre)* sprouts in new lawns in autumn, but can be easily eliminated on a warm day in autumn or in spring by 2,4-D.

RESISTANT WEEDS. The researchers have not yet found anything that is very good for many of the perennial grass weeds. These are so like the desired grasses that killing them is almost certain to kill the lawn grasses, too. Zytron is reported sometimes to kill nimblewill (*Muhlenbergia schreberi*) selectively in bluegrass, as will presumably a just-so application of maleic hydrazide. But there is need for more experimentation before these can be confidently recommended for general usage.

There are several useful non-selective chemicals, that is, compounds which kill back all vegetation. These may be the only recourse for especially pernicious and deep-rooting grass weeds, such as quackgrass. Dalapon is most frequently employed against weed grasses; amino triazole might serve in some situations. It is also possible to spot-treat with gasoline or kerosene, simazin, TCA, sodium arsenite, and so forth. With all non-selective treatments it is necessary to rework and reseed devastated spots.

For large seed beds soil sterilants can be helpful (such as methyl bromide, "Vapam," "Mylone"). Properly employed a few weeks before lawn seeding, they not only kill all vegetation but presumably insects and disease organisms as well. Soil sterilization is an operation for professionals rather than for home owners, since precise application and adequate equipment are important. And, of course, there is always the danger of injury to shrubs or trees which have roots running into the soil being treated.

OTHER METHODS. The plethora of chemicals already mentioned is certainly confusing. I shall not complicate matters further by discussing specialty items, in which a compound with limitations for general use might be especially effective against a given weed (neburon for chickweed, or endothal for certain speedwells). But another weed-control method remains, that is, mechanical instead of chemical removal. At one time this was laboriously accomplished by hand-pulling or digging. More recently special blades or attachments have been devised for mowers and thinning machines; these tear up trailing weeds, such as crabgrass, with little or no injury to the upright grasses (bluegrass and fescue), although stoloniferous bentgrass and Bermuda would be severely thinned. Some manufacturers supply an interchangeable blade for rotary mowers, which tears out crabgrass.

Perhaps we should even mention the old southern custom of smothering weeds and grass alike by laying roofing paper over the lawn. A modern version of keeping light and air from growing plants might be contrived with opaque polyethylene plastic sheets; these could be tacked onto the lawn by inserting long, large-headed nails through the edges of the sheets.

It is evident that there are innumerable ways of attacking lawn weeds, but elimination of the weeds is only the first step. Unless a good sod of bluegrass and fescue in the North, of Bermuda, zoysia, centipede, or St. Augustine in the South takes over afterwards, the problem will recur endlessly. The most important feature of weed control is planting quality grasses and managing them properly.

Buckthorn plantain *(Plantago lanceolata)*, the ubiquitous example of broad-leaved weeds which spring up in almost all lawns, is easily controlled with 2,4-D.

THE HERB GARDEN

By Olive Willett Smith

Olive Willett (Mrs. Harry Brokaw) Smith, author and lecturer, established her own St. Fiacre herb garden more than thirty years ago and dedicated it to this saint of gardens and gardeners. She is First Vice-President of the Herb Society of America. A former chairman of the New York Unit of this Society, Mrs. Smith is at present the Unit's garden and planting chairman.

The Herb Garden at The New York Botanical Garden has been redesigned and replanted under the direction of the Garden Committee of the New York Unit of the Herb Society of America. The garden for the study of herb collections, at the right of the formal garden, is not visible in this picture.

EVERY YEAR many thousands of people visit the Herb Garden of The New York Botanical Garden. Why do they? What is the fascination which draws them to this spot? Perhaps the answer may be found in their subconscious background, for the love of herbs reaches back to ancient times when herbs were man's food and medicine and provided the magic symbolism in his religious rites.

Among the first gardens established for the study of plants were herb gardens. As the scientific study of plants advanced slowly through the centuries, a system of classification emerged; and botanical gardens, as we know them today, were gradually developed with their systematic and ornamental plantings, their herbariums and libraries. A number of them retained plots for the study of herbs.

The beginning of the Herb Garden at The New York Botanical Garden goes back well over a decade, when a committee from the New York Unit of the Herb Society of America formally suggested the creation of such a garden. The Garden administration was most receptive to the offer, and plans were immediately made for its development. The Unit provided drawings and supervised the planting of the garden which was established on a plot, fifty-six by forty-two feet, slightly to the northeast of the Conservatory. A pleasing design of color and form was attained; many of the plants were given by members of the Unit. The Herb Garden soon proved to be a greatly appreciated addition to The New York Botanical Garden and a source of information to the gardening public.

The desire to enhance the educational aspect of the Herb Garden and the necessity to reduce its maintenance have brought changes to the earlier garden. The present arrangement includes two gardens—a formal garden and a garden for the study of herb collections.

The formal garden occupies the original site. In the center is a knot garden, an interlacing of design, patterned after great garden traditions. The thrids* outlining the closed pattern are formed of gray santolina (*Santolina chamaecyparissus*), green santolina (*S. virens*), and dwarf box (*Buxus sempervirens suffruticosa*). The knot is surrounded by walks of permanent weathered brick in basket design. The garden design is completed by planted borders arranged for a dramatic display of color and for a foil to the green and gray foliage of the herbs. Architectural effects are achieved by careful selection of the plants so that a stepped-down aspect is obtained of pleasing variations in height. Individual plants are clearly labeled with the common and scientific names, and often with information of historical interest.

A sundial, an armillary sphere mounted on a pedestal, is an important feature in the garden. It was presented to the garden by the New York Unit in memory of the late Helen Noyes Webster, a former president of the Herb Society of America, and it bears the inscription

"Yet a little while is the light with you
Walk while you have the light"

Inside the gate are sand-colored pottery jars that stood for many years in the earlier garden. These jars were a gift from Helen M. Fox. They contain specimens of myrtle (*Myrtus communis nana*).

An old wrought-iron fence encloses the Herb Garden. The design is that of a flame and a shepherd's crook. Brick columns and panels of open brickwork support the fence and complement it. They form an integral part of the area and are appropriate to the location and to the architectural background of the Botanical Garden. The fence, a gift from Harry Brokaw Smith, was installed by the Unit.

Adjacent to the formal Herb Garden is the garden for the study of herb collections. Here herbs are grown for observation and comparison. Beds are devoted to selected genera, and many kinds of each genera are grown in close proximity to each other. Paths make the beds accessible for close inspection. An interesting old bench, another gift from Mrs. Fox, is well located where the student may pause to arrange his notes or indulge in study while surrounded by herb specimens.

These recent gardens have been designed and established by the Garden

*corruption of the word thread; used in connection with a knot garden means narrow lines weaving or curving through other lines.

Damask rose, *Rosa damascena.*

Committee of the New York Unit with the assistance of the very able Horticulturist, Louis P. Politi.

The gardens offer a wide variety of interests. There are herbs that came into use in empirical medicine; their history may be traced from the beginning of man's records to the modern drug lists in the *United States Pharmacopoeia* and the *United States Dispensatory*. Falling over the brick edging in the garden is the low, gray, round-leaved Dittany-of-Crete (*Origanum dictamnus*), a sacred healing herb. Others are the lovely silvery green *Artemisia absinthium*, which Moses prescribed for the children of Israel because of its therapeutic bitterness—for the ancient Hebrews used many herbs for culinary, medicinal, and olefactory purposes and in religious rites; horehound with its frosty leaf pattern that lingers in the garden long after frost and is helpful for coughs and colds; stately digitalis, with its thimble-like flowers, used in prescriptions for heart disease; and golden and rosy yarrow which King Achilles is said to have found and with them healed his men wounded in battle.

The mints grow in variety and, like many other herbs, have divers uses and cannot be separated as medicinal, fragrant, and culinary. Here also grow herbs native to North America, for the Indians of the New World were versed in the use of herbs: the monardas, American pennyroyal (*Hedeoma pulegioides*), and wild ginger (*Asarum canadense*). Here, too, are herbs held in esteem in the *Doctrine of Signatures,* when it was believed that the appearance of a plant indicated its medicinal use—for example, lungwort with its spotted leaves was supposed to heal diseases of the lungs. And other herbs such as *Atropa belladonna,* a source of atropine, and poison-hemlock (*Conium maculatum*) from which supposedly was prepared the drink that poisoned Socrates.

Dr. William J. Robbins, Executive Director of the American Philosophical Society, then Director of The New York Botanical Garden, in discussing the renewed interest in herbs before a meeting of the Herb Society of America, said, "The development of organic chemistry and the synthesis in the laboratory of chemical compounds of therapeutic importance resulted for a time in a loss of interest in the medicinal potentialities of herbs. There is now, however, a realization that plants are greater chemists than we are in our laboratories, and that the biological significance of their chemical products should not be overlooked."

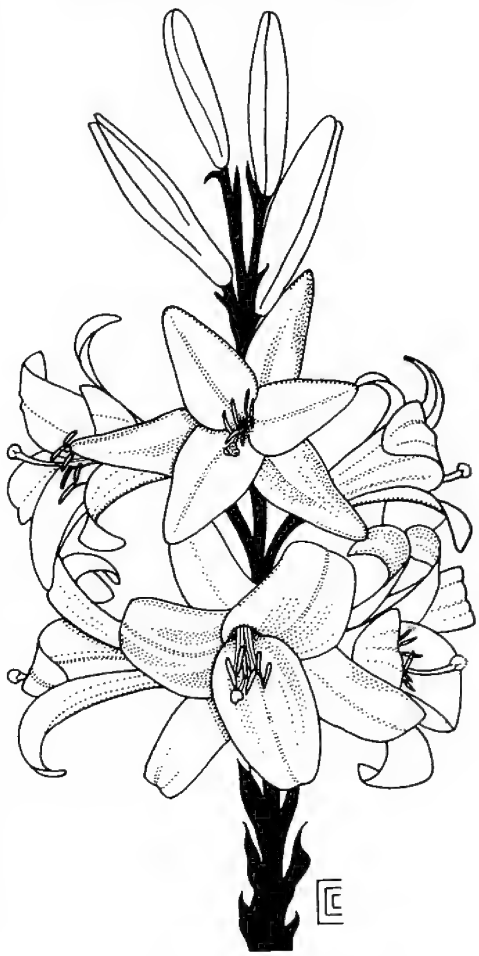
Among fragrant herbs, we again go back to the earliest records. In the *Book of Exodus*, we find our first formula for perfume, and Solomon sings:

> "Awake, O north wind: and come, thou south: blow upon my garden, that the spices thereof may flow out."

And surely from these herb gardens fragrance does go forth. In them the oldest roses in cultivation are not overlooked. There are *Rosa damascena,* brought to England by the Crusaders and one of the sources of attar of roses, and *R. gallica*, the Provence or French rose, that gives a lasting scent to potpourri. Another fragrant flower from the East is the Madonna lily; once established, it will make large patches. Lavender and rosemary are regarded by many as the herbs of enchantment — lavender, reminiscent of the beauty and fragrance of old English gardens, and rosemary, redolent of incense, enveloped in legends from Egypt, and growing riotously on warm hillsides in countries bordering on the Mediterranean. From Richard Banckes' *Herball* (1525) we learn that rosemary never grows higher than the height of Christ when he was a man on earth, and that after thirty-three years the plant increases in breadth but not in height. Southernwood (*Artemisia abrotanum*) was brought to America by our forefathers; many of us remember how we picked an aromatic sprig from this shrub, prominent in our grandmothers' gardens, to tuck into our belts. Meadowsweet (*Filipendula ulmaria*) is a "strewing herb—Queen Elizabeth I ordered that it be spread on the floors of her palace. The rhizomes of *Iris germanica* and variety *florentina* are dried and ground as a fixative for flower odors, and in Colonial days were used to starch and scent linens. These and many others are growing in the collection of fragrant herbs.

In the herb gardens, annual, biennial, and perennial culinary herbs flourish—the thymes and sweet marjoram which soften the edges of a walk, lovage whose leaves taste like celery, spicy basil, dark

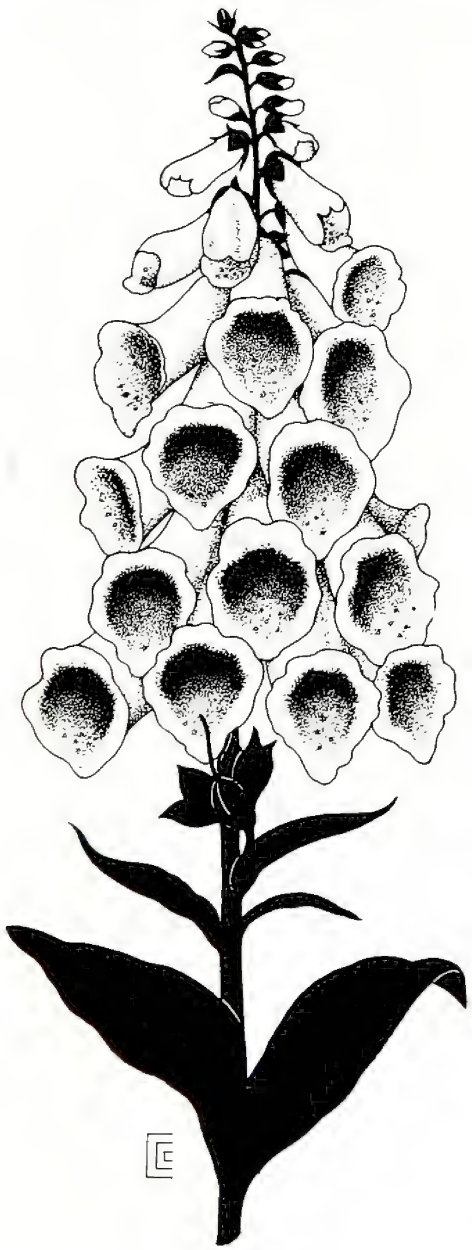
Madonna lily, *Lilium candidum.*



green savories, and the angel's herb or biennial angelica, to name only a few. Their stories are found on clay tablets of ancient Nineveh, inscribed with hieroglyphics on papyrus, mentioned in Biblical tithes, and written of in Greek and Roman histories. Their seeds traveled over the old trade routes to Europe. Their uses were recorded by hand in illuminated lettering on parchment in ancient monasteries. Printing made available to us their uses in the Still-room — through the old garden and cook books of Elizabethan England. From Colonial America the records of the herb garden at Mount Vernon, left by George Washington, attest their use.

In present-day living the importance of culinary herbs has not been overlooked, if one judges by the numerous articles in magazines and newspapers and the cook books on the subject. Grocery stores present their racks of assorted herbs, and the United States Government issues herbs to the commissaries of the armed forces. However, the cook should exercise discretion in the use of herbs. It is better to under-season than to over-season, for it is well to remember that the dried product is more potent than the fresh.

Foxglove, *Digitalis purpurea.*



Sage (*Salvia officinalis*), called "magic feather" by the Indians, is familiar in poultry dressings. Try it in pea soup. A leaf of rose-geranium (*Pelargonium graveolens*), baked in the bottom of a cake, will take you back in memory to your grandmother's tea-table. Your guests will be intrigued by the flavor of sassafras (*Sassafras albidum*) grated over apple pie or of a lemon-verbena leaf (*Lippia citriodora*) cooked in jam tarts. The savories are perfect condiments for vegetables—and what would tomatoes be without basil? In early days Bible leaf (*Chrysanthemum balsamita*) was used to mark a passage in the Bible or to nibble during prolonged sermons. Today, its broad leaf in an "old-fashioned" adds flavor—and conversation!

As in all gardens, it is not to be expected that the present plantings will remain static. Because of lack of space it has been necessary to omit interesting and useful herbs. There will be replacements, and also additions of herbs that so far have not been available, since there is a constant exchange of plants and seeds with botanical and horticultural institutions in this country and abroad.

A visit to these gardens will inspire flower arrangers to make use of herbs, for herbs will suggest new ideas in form, color, texture, and line. There is wide variety in leaf patterns from the large velvety *Pelargonium tomentosum*, the curling lady's-mantle (*Alchemilla vulgaris*) which, when folded, looks like a design for the cloak of a great lady, the glowing *Perilla*, to the lacy kinds of *Artemisia.* Then the flower-capped alliums are stunning in mass arrangements. When dried, flowers, foliage, and seed pods are excellent decorations to repeat summer colors in muted beauty.

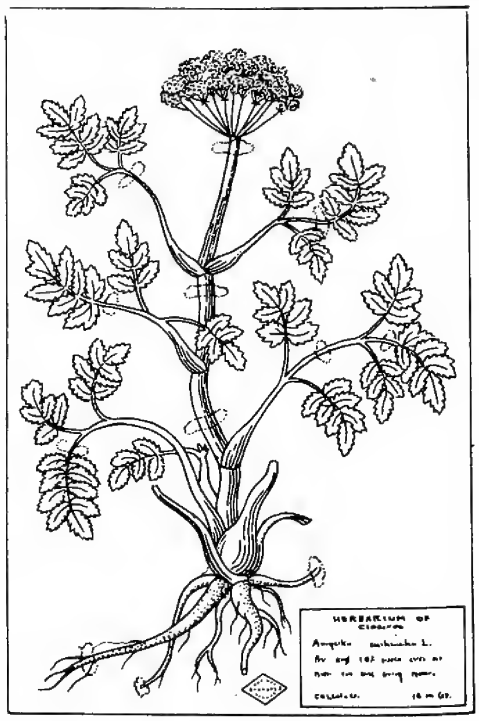
It is essential to have a collection of well-dried and scientifically prepared plant specimens for study. In 1952, at the suggestion of T. H. Everett, then Horticulturist, now Assistant Director (Horticulture) and Curator of Education, the New York Unit of the Herb Society of America, with the help of the botanical staff, established its own collection of herb specimens in the Garden's Herbarium. The Herbarium is located in the Museum and Administration Building.

The very great service of the Library of The New York Botanical Garden is reflected in the plantings of the herb garden. In the Library are monographs, periodicals, reprints, bulletins, and other papers in this specialized field. A part of the main reading room is devoted to current books on herbs. In the Barnhart Room are several hundred volumes, some beautifully illustrated, representing the herb literature of four centuries.

The enthusiastic understanding and admirable cooperation of the Librarian, Miss Elizabeth Hall, encourage the student. Miss Hall gives help, whenever needed, on many kinds of herbal problems.

All who are interested in growing herbs, or have the creative impulse to use them in the various ways in which they may be employed, will find at The New York Botanical Garden information and enjoyment in the Herb Garden and in the adjacent study collection of herbs, in the Herbarium, and in the Library.

Herbarium sheet of *Angelica archangelica.*



Above. These flowers, more than twice their usual size, were found in a remarkable colony of *Rhododendron calendulaceum* near Burningtown Gap, North Carolina.
Upper right. *Rhododendron cumberlandense* is of superior garden quality.
Lower right. A good ornamental form of *Rhododendron austrinum.*

NATIVE EASTERN AZALEAS

By David G. Leach

Mr. Leach is a geneticist whose hobby is hybridizing rhododendrons on a fairly large scale.

He spent the first three months of this year in Queensland, Australia, searching for *Rhododendron lochae,* and in Malaya, Thailand, and Cambodia scouting some of the rare lepidote rhododendrons. His book, *Rhododendrons of the World,* will be published by Scribners late in the spring or early summer 1960.

The following is based on the talk given by Mr. Leach at the annual meeting of the American Rhododendron Society, in Portland, Oregon; published originally in the Society's Bulletin and since rewritten, in parts, to direct it to a more general audience.

THE OCCIDENT was passed over lightly in the distribution of rhododendrons. Only about three per cent of the world's eight-hundred-odd species are native to Europe and America combined, with the United States enjoying the majority. But in deciduous rhododendrons (azaleas) the eastern portion of our country is the richest in the world.

Of the eighteen species in the Luteum Series, all but three are native to the states east of the Mississippi, and we have as a bonus two species in the Canadense Subseries. Most of these are fine ornamentals which have been rather badly neglected. The representatives of our eastern native azaleas that are occasionally seen in our gardens, are almost all inferior forms, far less attractive than the best that this handsome group offers. Perhaps because of unfamiliarity with the better forms, gardeners do not discriminate between the undistinguished average and the exceptionally superior, which is the normal ornamental range to be found in all the native azalea species.

Deciduous azaleas are highly evolved rhododendrons, the end-product of a long line of ancestors that included magnolias (magnolia family) and continued through camellias (tea family) into the heath family to which they, the azaleas, belong. During the imperceptible tide of geologic epochs, the Stamineum Series of *Rhododendron* made its appearance, followed by the Ovatum Series and the Albiflorum Series, and finally the Subseries Canadense *(Rhodora)* was evolved. The Obtusum Subseries (persistent-leaved) descended next, and from it came the deciduous azaleas of the Luteum Subseries as we know them today. The evidence for such a family tree is persuasive. The native American azaleas are of ancient lineage, among the aristocrats of the genus *Rhododendron* in the length of their patrician pedigree. But like many aristocrats they are all related, sometimes a little too closely for the convenience of those interested in unraveling their ancestry. The eastern azaleas are, for the most part, not at all well defined. There has been an enormous amount of crossing in the wild. In some locations in the North Carolina mountains, it is often

Rhododendron oblongifolium.

difficult to find a typical specimen with the classic characteristics of its species amid the welter of natural hybrids. Man has hastened the appearance of vast numbers of these hybrids by clearing the land, burning over scrub areas, making roads, and otherwise creating new ecological niches into which nature's hybrids can fit at a selective advantage. In fact, it seems that the natural hybrids spring up almost unfailingly to exploit the new environment.

I find it easiest to keep in mind the native azaleas by classifying them in color groups: the early whites (*R. alabamense, R. atlanticum*); the early midseason pinks (*R. canescens, R. nudiflorum, R. roseum*); the species in the red-yellow-orange group (*R. austrinum, R. speciosum, R. calendulaceum, R. bakeri, R. prunifolium*); and the late whites (*R. arborescens, R. viscosum, R. oblongifolium, R. serrulatum*).

Taking them in this sequence, *R. alabamense* is a rare species that is found only in the central part of northern Alabama. It is a little azalea of convenient height, rarely more than four feet tall, and blooms rather early in the total sequence of eastern azalea flowering. It is usually described as stoloniferous, but the plants in my garden have not been so, and those that I have seen in the wild can safely be said to be much less strongly stoloniferous than *R. atlanticum*, for example. Good forms of *R. alabamense*, with broad corolla lobes, make handsome shafts of white in the forefront of an azalea planting. The easiest way to identify this species is by crushing the foliage. The definitive jasmine or lemon scent from the foliage, in combination with the white flowers similarly fragrant, is a usually reliable means of identification. If the blossoms are pale pink, the plant comes from a natural cross with *R. canescens*, a species with which it is much too familiar.

The other "early" white is *R. atlanticum*, closely related to *R. alabamense*, but with a distribution ranging from southern Pennsylvania to South Carolina. Low-growing and strongly stoloniferous, this azalea forms colonies as much as twenty-five feet across and probably could be demonstrated to spread even farther, if anyone cared to determine the limits of a single plant by untangling it from a large stand. A young plant is apt to be a little diffuse in its ornamental effect, with a cluster of flowers atop each stem about twenty inches high; but when a sizable clump has been formed, this species is extremely effective as a dwarf azalea in the garden. Unfortunately, it is rare to find *R. atlanticum* in its typical form. I have seen it so only along the Seaboard Railway route near the northern border of North Carolina. Dr. Henry Skinner, Director of the U.S. National Arboretum, found typical plants also on the Delmarva Peninsula of Delaware. An easy identification can usually be made by the five rows of stalked glands near the tip of the dormant floral bud; but there are plants, six feet tall, in southeastern Pennsylvania which correspond in every botanical detail with *R. atlanticum*. Such giants, and smaller plants with pink flowers, are usually the result of natural hybridization with *R. canescens* in the South, or with *R. nudiflorum* in the North.

In the pink-flowered group of native azaleas, *R. canescens* comes into blossom first. It reaches up to fifteen feet, as found from North Carolina to Florida and westward into Texas, and it has been, I think, a little maligned as a garden decoration. The usual comment in books is that the ornamental effect of *R. canescens* can be obtained also by *R. roseum* and *R. nudiflorum*, which are hardier and generally superior. However, they do not bloom at the same season. *R. canescens* flowers a good deal earlier, at least in my garden in Pennsylvania, and its finest forms are absolutely first-rate, free-blooming, and effective garden shrubs. The rare and appealing salmon-pinks are not duplicated in the northern species, either. I shall concede only that the average quality of *R. canescens* for cultivation is below that of its northern relatives.

This species blooms along the edge of woodlands in late March in southern Georgia, where it often catches the eyes of tourists homebound from Florida. The flower color is apt to be pale and undistinguished, the blossoms rather small and somewhat crumpled, but superior forms farther north produce some plants with handsome blooms.

In the pink-flowered class of eastern native azaleas, *R. nudiflorum* follows next in bloom. This is usually a tall, vigorous shrub whose range extends from Massachusetts to North Carolina and westward into Indiana. Its western limit of distribution is often erroneously given as Ohio. Good forms of *R. nudiflorum* are remarkably fine ornamentals, free-flowering, easy to please, and covering themselves with a pale to deep pink blanket of blossoms. Poor forms tend to have twisted flower lobes and rather small blossoms of pallid color and a somewhat wrinkled appearance. The classic quick distinction from *R. roseum* is based on scent: *R. nudiflorum* has a sweet fragrance and its near relative a clove-like, spicy one. I find it easier to distinguish the two by their hairiness—*R. nudiflorum* is essentially without hairs on the dormant floral buds and *R. roseum* hairy. In Pennsylvania, at least, *R. nudiflorum* is likely to be found at lower elevations and *R. roseum* farther up the mountains. These two are often confused; I have seen one of the species labeled with the name of the other at one of the great flower shows in London.

Rhododendron nudiflorum and *R.*

Rhododendron canadense forma *albiflorum.*

roseum are reported to interbreed freely, but in this part of the state of Pennsylvania, where both are abundant, natural hybrids are not common. They are pretty well confined to narrow zones, where *R. nudiflorum* on the lower slopes overlaps *R. roseum* coming down from the higher.

Rhododendron roseum, in bloom at the same time, appears to be the more primitive and must be credited with being superior. It is found from New England to Virginia and westward into Missouri. Some forms have pink flowers, some have flowers so pale they are almost white, and others have flowers so deep they are almost red. The best forms, in my opinion, surpass in beauty any of the commercial modern azalea hybrids.

Many gardeners have become so preoccupied wtih large flowers that they forget that a profusion of smaller blooms may actually be more colorful than bigger blooms borne in clusters farther apart. In addition, there is in *R. roseum* and other azalea species a natural beauty arising from the subtle balance between size of flower and leaf and from their proportion as related to the structure of the branches. Here is a high standard of grace and distinction, which seems lacking in some of the commercial modern hybrids. The latter have their attractive features, but my plea is that we do not overlook the virtues of the species. There is plenty of room for them, not as botanical curiosities, but for their contributions as fine garden plants. *R. roseum* in its best forms qualifies on every score.

Rhododendron austrinum is the first to bloom in the red-yellow-orange group. It appears to be a primitive ancestor of the well-known flame azalea, *R. calendulaceum*. In its typical form, as seen in the lowlands of Georgia and Alabama and, to some extent, in northern Florida, it does not offer much as an ornamental, because its pale yellow flowers with reddish stripes on the outside are rather small and spidery in effect. But there are forms of *R. austrinum* which bear larger, handsome orange or clear yellow flowers, many in a cluster. Then it is a striking plant and one that is in flower before its color range is available from any other deciduous azalea. It is an upright shrub of medium size.

Next to bloom in this group is *R. speciosum*. No hybrid I have yet seen equals the incandescent reds, the luminous yellows, and the soft pastel blends of the superior forms of this species which are found in the lowlands of Georgia and South Carolina. *R. speciosum* is most often a shrub six or seven feet tall, and it is very free-blooming under cultivation. Natural hybrids with *R. canescens,* easily found in the wild, are stunning when mantled with their pale to vivid pink flowers. *R. speciosum* is easily distinguished from *R. calendulaceum*, because it is essentially nonglandular where the latter is glandular. Textbooks fail to mention that *R. speciosum* is also usually less vigorous and has a more delicate, graceful character

Rhododendron vaseyi var. *album* 'White Find'.

—because it is lighter in texture, a little smaller in leaf, and thinner in branch—than *R. calendulaceum*.

Rhododendron calendulaceum has been recognized for generations as a fine ornamental, but the very best forms are rarely seen in cultivation. This species seems to have descended from the early-blooming *R. austrinum* and the late-blooming *R. prunifolium*, and to have inherited the finest traits of each. It is an upland azalea, found at the higher elevations from Pennsylvania to Georgia, and the greater the altitude the deeper the color is likely to be. Unfortunately, the brilliant reds usually fade when the plants are dug and taken to gardens at lower elevations, but the yellows and orange are often extraordinarily effective. In some forms the blossoms are borne in globular trusses which have a grace lacking in the large-flowered garden hybrids. The forms with apricot-colored blooms are exceptionally appealing. The so-called "pink calendulaceum" and "white calendulaceum" result from natural crosses with *R. arborescens*.

A few years ago I was taken, with several others, by Dr. W. N. Fortescue to a site near Burning Town Gap in North Carolina. There we came across a stand of *R. calendulaceum* whose clear orange flowers were marked by a bold golden shield on the upper

Rhododendron bakeri.

lobe. The blossoms were about two and a half times larger than the average for the species, almost Oriental in their brilliance. This remarkable find points up the importance of obtaining the very best forms for garden use of the variable deciduous azalea species.

Rhododendron bakeri can best be described as a superior, later-blooming *R. calendulaceum*. I consider it a finer species because it is more compact in growth, not often over six or seven feet in height; because it holds its foliage in good condition to the end of the season; and because it blooms in late June. Its color includes not only yellows and orange, but also remarkable electric reds which retain their brilliance when the plants are grown at low altitudes. The fine forms bear clearly defined trusses of many flowers.

Where *R. bakeri* and *R. calendulaceum* occur at different altitudes so that their blooming seasons overlap, natural hybrids between the two are found. Offspring from crosses with *R. arborescens* in the wild are obtained in unusual pink shades, highly decorative for garden use.

Some years ago about sixty plants of Dr. Braun's *R. cumberlandense* were collected for me southwest of Cumberland, Kentucky. These have developed into a phenomenal group of azaleas, all

of outstanding garden quality, and have become the principal display of my garden in late June. As I believe they may be unique in cultivation, I have distributed seeds freely to botanical gardens, nurseries, and amateur enthusiasts.

It has been suggested that *R. cumberlandense* should be merged in *R. bakeri*, as there is not sufficient distinction to warrant two separate species. This particular group of *R. cumberlandense* has a different character and habit of growth from any *R. bakeri* that I grow or that I have seen elsewhere. The colors range from clear orange to blazing scarlet, with the majority in brilliant reds; the flowers are well presented. They are superior to "Camp's Red." I have not made a minute botanical comparison of the plants in this group with *R. bakeri*; but I am confident that there exist species of *Rhododendron* with less difference between them than that between *R. bakeri* and *R. cumberlandense*, as I know them from my own plants.

The last to come into flower of the yellow-orange-red group is *R. prunifolium*, a rare lowland species from a limited area along the Georgia-Alabama border. This azalea received a First-Class Certificate from the Royal Horticultural Society; it is certainly valuable for garden decoration, flowering in August and even in September when color from woody shrubs is at a premium. Orange and yellow flowers are seen occasionally, but the flowers are usually red—the best forms a vibrant red which shines in the landscape. *R. prunifolium* grows as much as fifteen feet tall.

When I scouted this species in the wild, it seemed to me to prefer low spots and shallow valleys, which possibly indicates a preference for moisture. Since it comes from such a limited geographic area, its hardiness might be expected not to vary appreciably, but some plants in my cold garden appear to be more bud-hardy than others.

The late whites, *R. arborescens, R. viscosum,* and *R. oblongifolium*, bloom about the same time, early July, in my garden, with *R. serrulatum* following much later, in early August. In the wild they vary considerably in every respect —the first three cross at every opportunity with other azaleas nearby. All are fragrant. *R. oblongifolium*, which comes from Arkansas, Texas, and Oklahoma, offers nothing unique as a garden plant. *R. arborescens* is probably superior to *R. viscosum* on the average; in its finest forms it is an extremely valuable azalea, for its cool-looking, immaculate white flowers appear just as the hot weather begins. On poor forms, the flower trusses are hidden by new growth and may have either under-sized flowers or narrow corolla lobes. As it ages, *R. arborescens* becomes a very large, spreading shrub; with its white flowers in bold contrast against the glossy foliage and scenting the garden for some distance, it is one of the stars of the genus. Its natural hybrids, resulting from repeated back-crosses with *R. bakeri* in the wild, are often remarkably beautiful in pastel pink and ivory and white.

Rhododendron arborescens has smooth branchlets and those of *R. viscosum* are bristly. If you have a late white azalea species and are wondering which species it is, this is an easy way to tell the difference. *R. arborescens* occurs from New York to Alabama, *R. viscosum* from Maine to South Carolina; where they overlap, they interbreed freely. In the Northeast *R. viscosum* is usually found near water, but it grows well in any average garden soil and varies a great deal in stature, from dwarf and stoloniferous to large and upright. The best forms seem to be intermediate in stature, vertical in growth habit, and to have flowers with shorter tubes, more abruptly dilated, which are freely borne in a forward position so that they are not hidden by the new growth. It blooms about the same time as *R. bakeri* and its blue-green foliage furnishes a pleasing contrast.

Rhodendron serrulatum is the latest-blooming species in the entire genus and can be found flowering in early November in central Florida. It is similar to *R. viscosum* but usually not quite so decorative. However, its white flowers with long tubes can provide an interesting note to northern gardens in August.

Rhododendron serrulatum.

Turning now to the two eastern species in the Canadense Subseries, we note that *R. canadense* comes into flower early, long before the azaleas of the Luteum Series make their contribution. This is the azalea beloved by poets, the rhodora, a neat little dwarf with grayish green foliage. It grows about three feet tall, spreads by underground stolons, and soon forms a nice clump which bears many small lavender-rose blossoms atop the naked stems. I am especially fond of forma *albiflorum*, whose white flowers are the first to usher in the azalea season each year. *R. canadense* extends its natural range from Labrador and Newfoundland to northern New Jersey. In the garden it wants a more acid soil than the other azaleas.

Rhododendron vaseyi blooms only a little later than *R. canadense*. I count it among the finest of all azaleas, but it is extremely variable in its ornamental value. I have some plants with flowers twice the size of others. The blossoms may be a pallid pink or they may be, in the wilderness, a velvety crimson which becomes a deep, rich pink in gardens at lower elevations. There is a strikingly beautiful, large-flowered white, called 'White Find', this was introduced by LaBars' Rhododendron Nursery, of Stroudsburg, Pennsylvania. Interplanted with the deep pink form, 'White Find' creates a scene of remarkable distinction—the myriad flowers poised on the branch tips suggest they are swarming pastel butterflies.

Rhododendron vaseyi comes from the mountains of North Carolina. It makes an upright shrub, old specimens as much as twelve feet tall, with an oddly light and graceful appearance when in bloom. It is highly regarded in Europe and sadly neglected in this country. I have never succeeded in crossing it with any other azalea, not even with *R. canadense* in its own subseries.

With the eastern natives contributing their wealth of bloom, azaleas can be had in flower from early spring until early fall, months before and months after the cultivated hybrids put on their show. The difference between the best and the poorest in each species is the

(Continued on page 107)

Dear Member:

In this special insert of *The Garden Journal*, we present the 1960 bulb list, available only to members of The New York Botanical Garden.

The varieties of hyacinths, tulips, narcissi, crocus, and miscellaneous bulbs have been carefully selected to include those which have been in demand over the years because of their fine performance, and some of the very choice recent introductions. These bulbs are of high quality – from a Holland grower who has the reputation of furnishing only the best – and of the particular sizes recommended to give satisfaction. The sizes are expressed in centimeters; for example, hyacinths 17-18 cms.

Prices are, in the main, the same as last year with the exception of the novelties and a few of the older varieties on which stock is limited this year.

We hope you will take advantage of this comprehensive offering of excellent bulbs to enrich the beauty of your spring garden next year.

In preparing your order, please:

1. Make sure that additions and Grand Total are correct.
2. On this special insert, make a record of the bulbs you have ordered. BULBS WILL BE IDENTIFIED BY NUMBER ONLY when you receive them.
3. *Print* shipping label in *ink*.
4. Draw check for Grand Total payable to The New York Botanical Garden.
5. As soon as possible, but not later than July 25, tear out page with order blank and shipping label and mail it with your check to:

   The New York Botanical Garden
   Department B
   Bronx Park
   New York 58, N. Y.

6. If you do not receive your bulbs by October 25, 1960, call Mrs. Hansell at The New York Botanical Garden – LUdlow 4-8500.

HYACINTHS

Hyacinths are excellent for the garden and are used for forcing. These are 17-18 cm. bulbs—the size recommended for all purposes; in pots and pans for forcing and for the garden.

Pink

1. GERTRUDE — $2.25 Rosy pink, compact flower. Medium early.
2. LADY DERBY — $2.25 Fine light pink, large bells.
3. PINK PEARL — $2.25 Deep rosy pink, large spike. Early.
4. QUEEN OF THE PINKS — $2.25 Bright rosy pink; large spike of fine bells. Late forcer, good for bedding.

Red

5. JAN BOS — $2.25 Beautiful scarlet. Very early.
6. LA VICTOIRE — $2.25 Brilliant carmine-red. Early.

White

7. EDELWEISS — $2.25 Pure white, broad compact spike.
8. L'INNOCENCE — $2.25 Pure white, very large well-shaped bells. Early and excellent for forcing.

Yellow

9. CITY OF HAARLEM — $2.25 Yellow, large spike, extra fine.
10. YELLOW HAMMER — $2.25 Yellow, large broad spike.

Light and Dark Blue

11. BISMARCK — $2.25 Sky-line, large spike, excellent for early forcing.
12. DELFT BLUE — $2.25 Bright porcelain-blue, compact spike.
13. DR. STRESEMANN — $2.25 Bright blue, large bells.
14. GRAND MAITRE — $2.25 Deep porcelain-blue.
15. KING OF THE BLUES — $2.25 The best dark blue; large well-formed spike on short stem. Late forcer.
16. MYOSOTIS — $2.25 Pale blue, long spike. Good forcer.

SINGLE EARLY TULIPS

Early tulips always make a splendid striking effect in any garden, whether planted in beds or smaller groups in borders. Size of bulbs, 12 cms. up.

17. COULEUR CARDINAL — $1.65 Brilliant crimson, slightly dewed outside.
18. GENERAL DE WET — $1.45 Orange, one of the most effective varieties for forcing and bedding, sweet scented.
19. KEIZERSKROON — $1.65 Bright red with broad golden-yellow border.
20. PRINCE OF AUSTRIA — $1.45 Orange-red, brilliant scarlet inside; very sweet scented.
21. URSA MINOR — $1.45 Deep golden-yellow.
22. VAN DER NEER — $1.45 Clear deep violet.
23. WHITE HAWK — $1.45 Pure white.

DOUBLE EARLY TULIPS

These tulips bloom a little later than single early tulips, and are excellent for planting in beds or borders. Size of bulbs, 11 cms. up.

24. BOULE DE NEIGE (Snowball) — $1.85 Large pure white.
25. MARECHAL NIEL — $1.75 Golden-yellow, flushed salmon-orange.
26. MR. VAN DER HOEF — $1.85 Pure golden-yellow.
27. MURILLO — $1.85 White, shading to delicate pink.
28. MURILLO MAXIMA — $1.85 Sport of Murillo, taller and earlier.
29. SCHOONOORD — $1.85 Snow-white.
30. TEAROSE — $1.90 Soft yellow, slightly shaded apricot.
31. VUURBAAK — $1.85 Scarlet; large flower on strong stem. Late.
32. WILHELM KORDES — $1.85 Bright orange, flushed red.

DARWIN TULIPS

No tulips equal the Darwin tulips in splendor and usefulness for various purposes. Size of bulbs, 12 cms. up.

33. AFTERGLOW — $1.25 Fine orange-rose with distinct orange edge.
34. BARTIGON — $1.05 Clear crimson-red.
35. CHARLES NEEDHAM — $1.30 Brilliant scarlet.
36. CITY OF HAARLEM — $1.25 Brilliant scarlet.
37. CLARA BUTT — $1.05 Clear self-colored salmon rosy pink.
38. FARNCOMBE SANDERS — $1.05 Fiery rose-scarlet.
39. GLACIER (syn. Wildlust) — $1.45 Ivory-white.
40. GOLDEN AGE — $1.25 Deep golden-yellow, shaded orange.
41. INSURPASSABLE — $1.05 Large lilac flower.

Price per Dozen, Except Where Noted.

42. LA TULIPE NOIRE – $1.25 Flower of a unique color.

43. NIPHETOS – $1.25 Ivory-yellow, large flower of good substance.

44. PRIDE OF HAARLEM – $1.05 Cerise-scarlet, a stately plant for borders and amongst shrubs.

45. PRIDE OF ZWANENBURG – $1.45 Pure salmon-pink, large flower.

46. PRINCESS ELIZABETH – $1.15 Vivid rose-pink.

47. PRINCESS ELIZABETH MAXIMA – $1.15 Large-flowering sport of Princess Elizabeth.

48. QUEEN OF BARTIGONS – $1.45 Pure salmon-pink.

49. RED PITT – $1.05 A bright red sport of William Pitt.

50. SCOTCH LASSIE – $1.05 Deep lavender.

51. THE BISHOP – $1.25 Bright violet-blue, large flower.

52. WILLIAM PITT – $1.05 Cerise-red with a darker shade on the outer petals.

53. WM. COPELAND – $1.05 Lovely lilac.

54. ZWANENBURG – $1.25 Pure white, large flower.

DARWIN HYBRID TULIPS

A new race of tulips, the results of crossings between Darwin tulips and Fosteriana varieties. They have enormous flowers on strong stems and vivid colors. Size 12 cms. up.

55. GENERAL EISENHOWER – $1.45 Orange-red.

56. GUDOSHNIK – $2.75 Yellow, spotted red.

57. HOLLAND'S GLORIE – $1.60 Orange-scarlet, black base.

58. LEFEBER'S FAVORITE – $1.45 Glowing scarlet, yellow base.

59. RED MATADOR – $1.25 Carmine-scarlet.

60. ROOSEVELT – $1.65 Clear orange-red, extra large, well-formed flower.

SINGLE LATE OR COTTAGE TULIPS

Cottage tulips have various shaped flowers and habits and are splendid for gardening purposes and cut flowers. Size of bulbs 12 cms up.

61. CARRARA – $1.05 Pure white.

62. DIDO – $1.25 Orange-rose, margined orange-yellow.

63. GOLDEN HARVEST – $1.05 Deep lemon-yellow, large flower.

64. INGLESCOMBE YELLOW – $1.05 Canary-yellow, fine bedder.

65. MARJORIE BOWEN – $1.05 Salmon orange-rose, exquisite variety.

66. MRS. JOHN T. SCHEEPERS – $1.35 Pure yellow, large oval flowers.

67. PRINCESS MARGARET ROSE – $1.05 Yellow, edged and flushed orange-red, sport of Inglescombe Yellow.

68. SMILING QUEEN – $1.45 Beautiful satiny pink, with silvery edge.

69. WHITE CITY (MOUNT EREBUS) – $1.25 Pure white, creamy anthers.

LILY FLOWERING TULIPS

These tulips belong to the Cottage Tulip family and bloom at the same time. Their distinct shape, more or less resembling lilies, made it desirable to group them under a separate head. They are splendid for groups in borders and are very artistic cut flowers. Size of bulbs, 12 cms. up.

70. ALASKA – $1.45 Pure yellow, sweet scented.

71. CAPTAIN FRYATT – $1.45 Garnet-red, violet-blue center.

72. CHINA PINK – $1.35 Pink, white base.

73. MRS. MOON – $1.45 Pure yellow, elegant shape.

74. WHITE TRIUMPHATOR – $1.15 Pure white.

DOUBLE LATE OR PEONY FLOWERING TULIPS

They are splendid in borders and fine for cutting. Size of bulbs, 12 cms. up.

75. MAY WONDER – $1.60 Clear rose, somewhat lighter towards the base. Strong large flower on strong stem.

76. MOUNT TACOMA – $1.45 Pure white, large flower.

77. ORANGE TRIUMPH – $1.45 Orange-red, flushed brown and narrow yellow edge.

78. UNCLE TOM – $1.45 Dark, glittering red, extra double.

PARROT TULIPS

On account of their large heavy flowers Parrot tulips are not recommended for planting in beds. In groups and in borders, they are very effective and they are excellent for cutting. Size of bulbs, 12 cms. up.

79. BLUE PARROT – $1.05 Rich bluish heliotrope.

80. DISCOVERY – $1.65 Pink sport of Princess Elizabeth.

81. FANTASY – $1.05 Lovely soft rose with green streaks, inside salmon-rose; flowers on erect stems.

82. TEXAS GOLD – $1.05 Deep yellow sport of Inglescombe Yellow.

TULIP SPECIES (Botanical Tulips)

Top-size Bulbs

83. *Acuminata (Cornuta, Stenopetala)* – $1.85 Red and yellow; very long pointed flower.

84. *Clusiana* – $1.45 Outer petals cherry-red, inner petals white.

85. *Eichleri* – $1.65 Fine vermilion-orange.

Price per Dozen, Except Where Noted.

86. *Fosteriana* CANTATA — $2.75 Vermilion-red, foliage shiny green.

87. *Fosteriana* GALATA — $1.65 Orange-scarlet, yellow base.

88. *Fosteriana* PRINCEPS — $1.45 Orange-scarlet, very large.

89. *Fosteriana* RED EMPEROR (Mme LEFEBER) — $1.45 Dazzling vermilion-red.

90. *Fosteriana* PURISSIMA — $4.75 White.

91. *Kaufmanniana* — $1.45 The waterlily tulip, creamy yellow outside, shaded soft red, inside deep yellow.

92. *Kaufmanniana* CESAR FRANCK — $3.25 Deep yellow, outside red with yellow edge.

93. *Kaufmanniana* ELLIOTT — $2.20 Pure white, outside bright rosy red.

94. *Kaufmanniana* GAIETY — $2.95 White, outside red.

95. *Kaufmanniana* JOHANN STRAUSS — $2.20 White, outside blotched red.

96. *Kaufmanniana* SHAKESPEARE — $3.25 Salmon shades.

97. *Kaufmanniana* STRESA $2.35 Red, edged yellow.

98. *Kaufmanniana* THE FIRST — $2.20 Carmine, edged white.

99. *Kaufmanniana* VIVALDI — $2.75 Yellow, red spotted; inside cream with red ring.

100. *Praestans* FUSILIER — $2.20 Vermilion-orange, bunch-flowering.

101. *Sylvestris (Florentina Odorata)* — $2.20 Yellow, fragrant.

BREEDER TULIPS

With their dark colors in bronze, mahogany, orange and purple, they make a striking contrast with the bright colors of the Darwins. Size of bulbs, 12 cms. up

102. DILLENBURG — $1.05 Glowing salmon-orange.

103. INDIAN CHIEF (MEYERBEER) — $1.35 Coppery red flower of exquisite form on long stem.

104. LOUIS XIV — $1.45 Dark purple flushed with bronze, edging to golden-brown; inside purple.

105. PRESIDENT HOOVER — $1.25 Brilliant orange-red.

106. PRINCE OF ORANGE (ORANGE BEAUTY) — $1.25 Deep orange-red, golden-orange margin.

REMBRANDT TULIPS

Size of bulbs, 12 cms. up

107. AMERICAN FLAG — $1.45 Bright red, striped and flaked white.

108. CORDELL HULL — $1.05 Red, striped rosy and white, sport of Bartigon.

DAFFODILS AND NARCISSI

Very popular for gardening, splendid for cutting, and for forcing in large quantities, they have an important place in the world of bulbs. For naturalizing, planting in woodlands, no flower is so popular. Top-size, double nose I.

Yellow Trumpets

109. FLOWER CARPET — $2.40 Deep golden-yellow.

110. KING ALFRED — $2.10 Clear golden-yellow; great substance; excellent for forcing as well as for the garden.

111. MAGNIFICENCE — $2.20 Deep golden-yellow, good-sized flower on strong stem. Very early.

112. REMBRANDT — $2.30 Deep golden-yellow perianth and trumpet; flower of fine proportions.

113. UNSURPASSABLE — $2.75 Very large, golden-yellow.

Bicolor Trumpets

114. MUSIC HALL — $2.40 White perianth, yellow trumpet.

115. PRESIDENT LEBRUN — $2.40 Perianth white, trumpet lemon-yellow passing to creamy white.

116. QUEEN OF BICOLORS — $2.40 Perianth, white, trumpet canary-yellow, large flowers. Early.

117. SPRING GLORY — $2.40 White perianth, large yellow trumpet.

White Trumpets

118. BEERSHEBA — $2.20 Beautiful pure white variety.

119. MRS. E. H. KRELAGE — $2.10 Trumpet creamy, changing to pure white. Medium early.

Large-Cupped Narcissi

120. CARBINEER — $2.20 Broad flat yellow perianth, large cup, deep orange-red.

121. CARLTON (NIMROD) — $2.10 Uniform soft yellow; large cup, beautifully shaped. Early.

122. FLOWER RECORD — $1.80 White perianth, deep yellow cup edged orange.

123. FORTUNE — $2.20 Broad flat overlapping yellow perianth; very large, orange crown. Early.

124. JOHN EVELYN — $2.10 Large overlapping ivory-white perianth; large flat apricot crown, heavily frilled.

125. MRS. R. O. BACKHOUSE — $1.90 Ivory-white perianth; graceful apricot-pink trumpet with deeply fringed edge.

126. SCARLET ELEGANCE — $2.10 Perianth deep yellow; cup deep orange-red, scarlet edge.

127. SELMA LAGERLOF — $2.40 Large pure white perianth; red crown edged yellow.

128. SEMPRE AVANTI — $2.10 Creamy white perianth; large bright orange cup.

129. TUNIS — $2.20 Broad white overlapping perianth; large cup, soft primrose, shaded gold. Early.

Small-Cupped Narcissi

130. EDWARD BUXTON — $1.65 Light yellow perianth; deep orange cup.

Price per Dozen, Except Where Noted.

131. LA RIANTE — $1.65 Perianth pure white; cup deep red. Medium early.

132. VERGER — $1.80 Pure white perianth; deep red cup. Medium early.

Poeticus

133. ACTAEA — $1.65 Large pure white perianth of perfect shape; brilliant scarlet eye. Medium early.

Poetaz

134. CHEERFULNESS — $1.65 White perianth with fully double center of white and yellow. Medium early.

135. CRAGFORD — $2.30 White perianth; deep orange crown.

136. GERANIUM — $1.65 Round flat pure white perianth, deep orange-red cup. Very late.

137. LAURENS KOSTER — $1.65 White perianth; deep yellow cup. Well-known forcing variety. Early and free-flowering.

138. L'INNOCENCE — $1.65 Pure white perianth, cup canary-yellow.

139. YELLOW CHEERFULNESS — $1.95 Soft yellow, double.

Double Daffodils

140. INGLESCOMBE — $1.80 Uniform pale yellow. Medium early.

141. MARY COPELAND — $2.75 Outer petals pure creamy white, inner petals lemon-yellow and brilliant orange.

142. TWINK — $1.80 Semi-double, primrose with inner petals of light orange; tall strong stem.

Narcissus Campernelli and Jonquilla

143. *Odorus Rugulosus* (Single *Campernelli*) — $1.05 Golden-yellow flowers, two to four to a stem; fragrant.

144. *Odorus Plenus* (Double *Campernelli*) — $1.60 Fragrant double golden-yellow flowers on tall stem.

145. *Odorus* ORANGE QUEEN — $1.60 Deep orange-yellow flowers, two or three to a stem; free flowering.

146. *Jonquilla* Single — $.95 Sweet-scented, deep yellow, with rush-like foliage.

147. *Jonquilla* TREVITHIAN — $1.85 Pale lemon-yellow perianth, clear yellow cup.

Narcissus Species

148. *Bulbocodium* — $.95 Rich golden-yellow.

149. *Bulbocodium Citrinus* — $1.60 Sulphur-yellow.

150. *Cyclamineus* — $1.45 Clear yellow, reflexed petals.

151. *Cyclamineus* FEBRUARY GOLD — $2.10 Yellow perianth, trumpet golden-yellow.

152. *Triandrus Albus* (ANGEL'S TEARS) — $.95 Silvery white, two and more drooping flowers on a stem.

153. *Triandrus* SILVER CHIMES — $4.25 Four to six flowers on a stem, nodding and graceful. Pure white perianth, pale primrose cup.

154. *Triandus* THALIA — $2.30 Larger than *albus,* pure white.

155. W. P. MILNER — $1.85 Sulphury white, dwarf, free flowering.

CROCUS

Size of bulbs — 10 cms.

Blue and Purple

156. ENCHANTRESS — $.45 Soft blue.

157. GRAND MAITRE — $.45 Dark blue.

158. QUEEN OF THE BLUES — $.45 Porcelain-blue.

Striped

159. PICKWICK — $.55 Purple stripes on white base.

160. STRIPED BEAUTY — $.55 Blue, striped white.

White

161. SNOWSTORM—$.65 Pure white, free-flowering.

Yellow

162. YELLOW MAMMOUTH — $.40

CROCUS SPECIES

Top-size bulbs

163. *Chrysanthus* E. P. BOWLES — $.45 Yellow, outside purple.

164. *Chrysanthus* SNOWBUNTING — $.55 White, greyish feathers.

165. *Chrysanthus* ZWANENBURG BRONZE — $.45 Bronze.

166. CLOTH OF GOLD *(Susianus)* — $.30 Golden-yellow feathered brown.

167. CLOTH OF SILVER *(Versicolor)* — $.45 Silvery white, striped lilac.

168. *Etruscus* — $.40 Mauve.

169. *Sieberi* —$.40 Soft blue with orange stigma.

170. *Tomasinanus* — $.30 Pale lavender.

171. *Vernus* VANGUARD — $.45 Silver greyish lilac. Early.

MISCELLANEOUS BULBS

172. *Scilla campanulata* — $.60 In blue, pink, and white. Size of bulbs, 9-10 cms.

173. *Scilla sibirica* — $.60 Sky-blue.

174. *Scilla sibirica alba* — $.60 White. Size of bulbs, 8 cms. up.

175. *Galanthus nivalis* — $.60 Pure white. Size of bulbs, 6 cms. up.

176. *Chionodoxa luciliae* — $.35 Lilac-blue.

177. *Chionodoxa gigantea* — $.35 Light blue.

178. *Chionodoxa sardensis* — $.35 Bright blue.

179. *Muscari armeniacum* — $.35 Bright blue.

180. *Muscari botryoides coerculeum* — $.45 Blue.

181. *Muscari botryoides album* — $.45 White.

BULBS FOR NATURALIZING

Not ordered in dozen lots.

182. CHIONODOXA — $14.00 M; $1.45 C Mixed colors.

183. CROCUS — $23.00 M; $2.50 C — Size of bulbs, 8 cms.

184. NARCISSUS — $120.00 M; $12.50 C A fine mixture of types and colors. Top-size.

185. NARCISSUS — $80.00 M; $8.50 C First-size.

Price per Dozen, Except Where Noted.

GOLD MEDAL NARCISSI

A selection of choice varieties.

Yellow Trumpets

186. GOLDEN MARVEL—$4.65 Soft golden-yellow throughout; one of the best yellow trumpets ever introduced.

187. GRAPEFRUIT — $11.25 Soft lemon-yellow throughout, tinged with pale apricot.

Bicolor Trumpets

188. LANTANA — $6.00 Pure white perianth with large golden-yellow trumpet.

189. WORLD'S FAVORITE — $2.40 Pure white perianth with a very large, soft yellow trumpet.

Large-Cupped Narcissi

190. BAHRAM — $2.10 Yellow perianth with deep orange-red crown.

191. BERMUDA — $2.30 Soft yellow perianth; the large spreading crown, clear orange.

192. CHAMPAGNE — $3.25 Pure white perianth with creamy white, broadly edged apricot-pink cup.

193. DELIBES —$3.15 Round golden-yellow perianth with a flat orange-red crown.

194. DICK WELLBAND — $2.20 White perianth; rather flat orange cup.

195. DUKE OF WINDSOR — $3.60 White perianth; large spreading crown, orange-apricot.

196. FERMOY — $5.25 Pure white perianth; frilled bowl-shaped crown, orange-red.

197. LA ARGENTINA — $2.20 White perianth; heavily frilled and almost double crown is yellow and stained orange-scarlet.

198. MAKASSAR — $2.75 Golden orange-yellow throughout.

199. MARY ROOZEN — $2.40 Deep golden-yellow perianth; large and frilled crown glowing orange throughout.

200. PINK FANCY — $2.10 White perianth; large crown apricot, broadly margined soft pink.

201. RED GOBLET — $7.20 Deepest golden-yellow perianth; goblet-shaped crown, deep orange-red.

202. ROYAL CROWN — $2.40 Silvery white perianth; large heavily frilled crown of soft apricot.

203. TINKER — $2.60 Clear golden-yellow perianth; long goblet-shaped cup of brilliant orange-scarlet.

Small-Cupped Narcissi

204. CHUNGKING — $6.00 Clear golden-yellow perianth; intensely deep red shallow crown.

205. AMATEUR — $2.30 White perianth; large, flat, bright scarlet crown.

206. LADY KESTEVEN — $1.95 Snow-white perianth; cherry-red cup.

207. POLAR ICE — $2.20 Medium-sized pure white, with a frilled cup.

208. POMONA — $1.95 Pure white round perianth; shallow and spreading crown lemon-yellow, edged pale apricot.

Poetaz Narcissi

209. MARTHA WASHINGTON — $2.75 Strong white perianth; large orange cup; two, but mostly three flowers to a stem.

Double Daffodils

210. HOLLANDIA — $3.60 Golden-yellow flat perianth; only the crown is double, and deep orange-red.

211. MRS. WM. COPELAND — $2.40 Creamy white.

Price per Dozen, Except Where Noted.

ORDER BLANK

Please Order By Number Only — *Check Must Accompany Order*

Bulb No.	Quantity	Price Per Doz.	Amount
1		2.25	
2		2.25	
3		2.25	
4		2.25	
5		2.25	
6		2.25	
7		2.25	
8		2.25	
9		2.25	
10		2.25	
11		2.25	
12		2.25	
13		2.25	
14		2.25	
15		2.25	
16		2.25	
17		1.65	
18		1.45	
19		1.65	
20		1.45	
21		1.45	
22		1.45	
23		1.45	
24		1.85	
25		1.75	
26		1.85	
27		1.85	
28		1.85	
29		1.85	
30		1.90	
31		1.85	
32		1.85	
33		1.25	
34		1.05	
35		1.30	
36		1.25	
37		1.05	
38		1.05	
39		1.45	
40		1.25	
41		1.05	
42		1.25	
43		1.25	
44		1.05	
45		1.45	
46		1.15	
47		1.15	
48		1.45	
49		1.05	
50		1.05	
51		1.25	
52		1.05	
53		1.05	
54		1.25	
55		1.45	
56		2.75	
57		1.60	
58		1.45	
59		1.25	
60		1.65	
61		1.05	
62		1.25	
63		1.05	
64		1.05	
65		1.05	
66		1.35	
67		1.05	
68		1.45	
69		1.25	
70		1.45	
71		1.45	
72		1.35	
73		1.45	
74		1.15	
75		1.60	
76		1.45	
77		1.45	
78		1.45	
79		1.05	
80		1.65	
81		1.05	
82		1.05	
83		1.85	
84		1.45	
85		1.65	
86		2.75	
87		1.65	
88		1.45	
89		1.45	
90		4.75	
91		1.45	
92		3.25	
93		2.20	
94		2.95	
95		2.20	
96		3.25	
97		2.35	
98		2.20	
99		2.75	

order blank continues on other side

SHIPPING LABEL

ORDER **Nº 1237**

CONTENTS: Merchandise. Package may be opened for inspection.

SHIP TO:

Name .....
(Please Print)

Street Address .....

City ..... **Zone No.** ..... **State** .....

Member's Name

Bulb No.	Quantity	Price Per Doz.	Amount
100		2.20	
101		2.20	
102		1.05	
103		1.35	
104		1.45	
105		1.25	
106		1.25	
107		1.45	
108		1.05	
109		2.40	
110		2.10	
111		2.20	
112		2.30	
113		2.75	
114		2.40	
115		2.40	
116		2.40	
117		2.40	
118		2.20	
119		2.10	
120		2.20	
121		2.10	
122		1.80	
123		2.20	
124		2.10	
125		1.90	
126		2.10	
127		2.40	
128		2.10	
129		2.20	
130		1.65	
131		1.65	
132		1.80	
133		1.65	
134		1.65	
135		2.30	
136		1.65	
137		1.65	
138		1.65	
139		1.95	
140		1.80	
141		2.75	
142		1.80	
143		1.05	
144		1.60	
145		1.60	
146		.95	
147		1.85	
148		.95	
149		1.60	
150		1.45	
151		2.10	
152		.95	
153		4.25	
154		2.30	
155		1.85	
156		.45	
157		.45	
158		.45	
159		.55	
160		.55	
161		.65	
162		.40	
163		.45	
164		.55	
165		.45	
166		.30	
167		.45	
168		.40	
169		.40	
170		.30	
171		.45	
172		.60	
173		.60	
174		.60	
175		.65	
176		.35	
177		.35	
178		.35	
179		.35	
180		.45	
181		.45	
182		14.00M	
182		1.45C	
183		23.00M	
183		2.50C	
184		120.00M	
184		12.50C	
185		80.00M	
185		8.50C	
186		4.65	
187		11.25	
188		6.00	
189		2.40	
190		2.10	
191		2.30	
192		3.25	
193		3.15	
194		2.20	
195		3.60	
196		5.25	
197		2.20	
198		2.75	
199		2.40	
200		2.10	
201		7.20	
202		2.40	
203		2.60	
204		6.00	
205		2.30	
206		1.95	
207		2.20	
208		1.95	
209		2.75	
210		3.60	
211		2.40	

GRAND TOTAL .....

MIST PROPAGATION

By Albert Lowenfels

Mr. Lowenfels, who is a member of The New York Botanical Garden, has been an amateur gardener for half a century. He has the distinction of being the only non-professional member of the Plant Propagators Society — this in recognition of his application of mist propagation of cuttings on his estate, Willow Lake Farm, in White Plains, New York.

The author's greenhouse is covered with plastic instead of glass and is interlined with lighter plastic to conserve heat. Above, entrance. Right, side view.

ESSENTIALLY every gardener is a propagator — he enjoys making things grow, then flower, bear fruit, and add to the beauty of his home grounds. But if more gardeners would learn how easy it is to start their own plants from cuttings, I am sure their pleasure in gardening would increase. For, after all, what greater joy is there than in creating something—and that is exactly what one does when he takes a seed or cutting and helps it to develop into a shrub or tree.

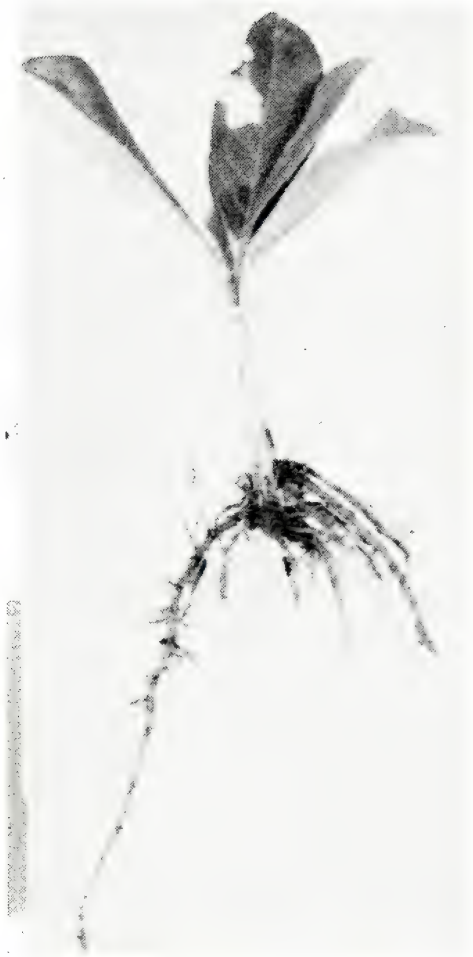
There are several ways to increase plants—by sowing seed, layering (including air-laying), grafting, budding, and taking cuttings. During the past ten years, tremendous strides have been made in the art of growing plants from cuttings, because of the introduction of the so-called plant hormones, which were developed by Drs. Zimmerman and Hitchcock at Boyce Thompson Institute for Plant Research and are now available commercially, and because of "mist" or "fog line."

One of the pioneers in the use of both plant hormones and mist is James S. Wells of Red Bank, New Jersey. And a commendable trait of Mr. Wells is his willingness to disseminate what he has learned about plant propagation through his articles in horticultural publications and through his book, *Plant Propagation Practices*. I became seriously interested in plant propagation when I visited the nursery in South Jersey that Mr. Wells was then managing. It was one of the hottest days I can recall, and I saw azalea cuttings turgid and thriving in that intense July heat because of the mist being sprayed on them.

When I returned to my home in White Plains, I removed the sash from a pit coldframe, purchased some pipe and nozzles (nozzles from oil burners), and in a few hours had constructed a mist system. Then I dug out the soil from the coldframe, placed good-sized bluestone on the bottom for drainage, and covered that with a mixture of sand and peat moss. With a garden hose, I connected the "fog line" over the newly made bed to a water line. Every morning the water was turned on, at night it was turned off; it was also turned off in rainy weather. The results were good, and I was fascinated by the possibilities. I planted cuttings of azaleas, yews, and a few other shrubs, dipping them in "Rootone," or "Hormodin," commercial plant hormone preparations.

That winter I studied the subject, reading all I could find about it. I learned, among other things, that all-day watering was not necessary, that better results were obtained with less water. So I bought a time clock and a water valve that operates on electric impulse (it is called a solenoid valve) and set them to turn on the mist six seconds out of every minute. I learned also—through a series of tests conducted by Boyce Thompson Institute—that one could take cuttings of lilacs in early May when the first flush of cutting growth starts. So I started with early May cuttings of lilacs and then continued to take soft green-wood cuttings of magnolias, pink dogwood, azaleas, and other plants all summer—in fact, until early September when I began to put in holly cuttings. Again the results were good.

The following winter at a meeting of the Plant Propagators Society, I met another leader in plant propagation, Harvey Templeton, Jr., of Winchester, Tennessee, and learned of his invention, the electronic leaf. This is a simple piece of plastic in which are imbedded two pieces of any good electrical conductor (carbon is one) connected to a small amplifier which resembles a one-tube radio set. This in turn is connected to the solenoid valve, and there is also a connection to a light socket for power. While this explanation may make the set-up seem complicated, it really is not complicated. The system is simply this: when the electronic leaf in the bed of cuttings becomes dry, the mist goes on; as soon as the leaf is wet, the mist goes off and does not start until the little electronic leaf is again dry. The advantage of



The fine root system on a magnolia cutting and, above right, a rooted cutting of a red maple — both from the author's propagating bench.

this system is that when it rains, or the atmosphere is full of moisture, the "leaf" calls for little water, and so the cuttings get only the amount needed.

Later I learned of another device which serves the same purpose. Two tubes, kept a fraction of an inch apart on a small wooden stand, are connected to a mercury switch which activates the solenoid valve. These tubes are inserted in the middle of the cutting bed; when a film of water from the fog line makes a contact between them, the water supply stops.

To make the system fully automatic, because I am at my office in New York City almost every day, I set an electrical clock to go on and off according to the length of daylight. For example, in the summer, the clock goes on at 7:45 in the morning and off at seven in the evening. Even when I am away from home for long weekends, the mist system has not failed to function.

Incidentally, special nozzles are now sold for mist propagation, and the entire investment for a fair-sized system need not be more than one hundred dollars. A smaller system which does not operate automatically—but can be modified to do so—is sold for about thirty dollars.

There are two theories on why mist helps cuttings to root: (1) As soon as a piece of a branch or cutting is taken

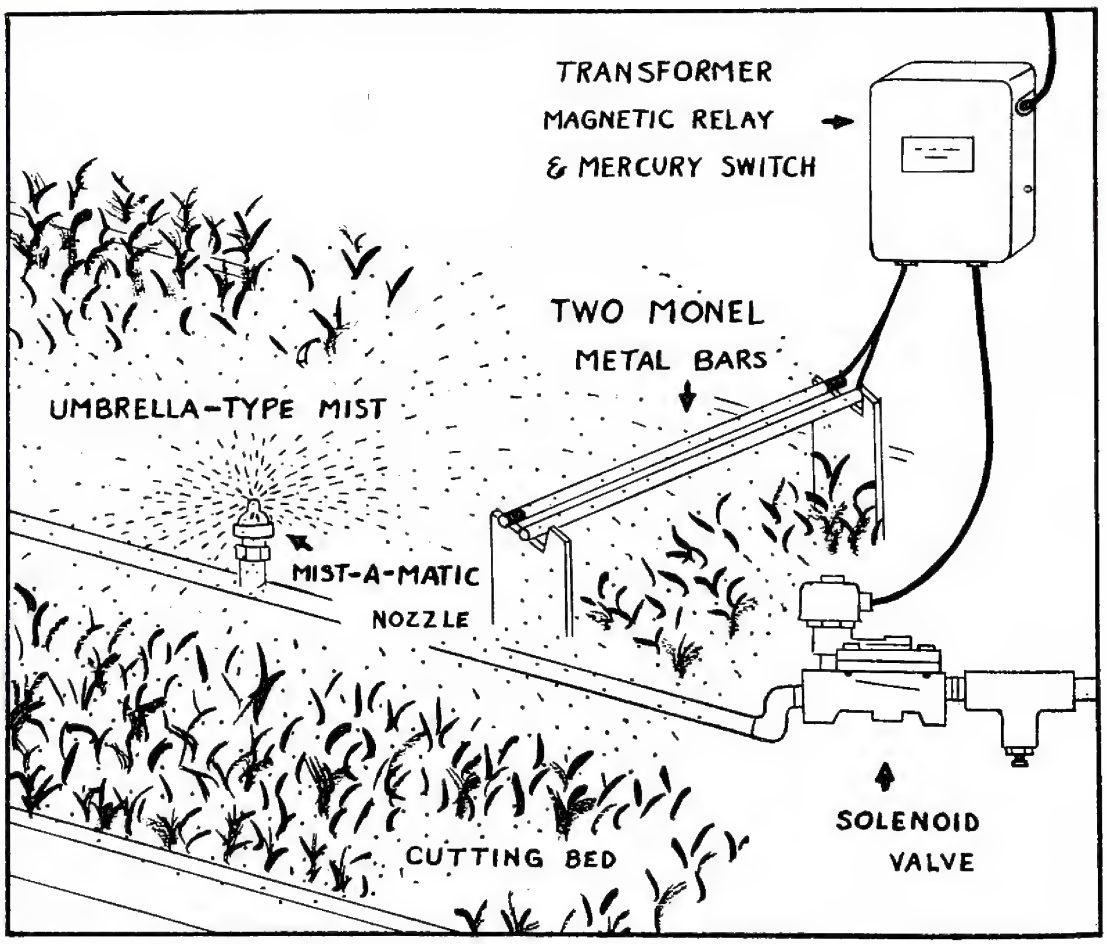


Diagram of the "Mist-A-Matic," a simplified automatic mist-propagation system.

from a plant, the leaves transpire, wilting starts, and the cutting usually dies. But if the leaves can be kept moist until the cutting forms its own roots and can nourish itself, there is a good chance of getting a plant. (2) It is known that if the medium around the cutting is kept warmer than the leaves, rooting is induced. Mist tends to cool the leaves and thus reduce evaporation. Probably a combination of both these factors is the real reason for rooting cuttings successfully by a fog line.

What medium do I use? Well, originally sharp sand was used for cuttings, but then it was evident that ericaceous plants like some organic matter, so peat moss was added. Lately a new product, "Perlite" — alone or in combination with peat moss—has been giving satisfactory results. One must remember that the medium serves to hold the cuttings upright, to retain moisture, and to furnish air, for oxygen is necessary in plant growth.

In the past few years, I have built a greenhouse, sixteen by twenty-seven feet, of plastic material instead of glass. A hot-air heater prevents the temperature from falling below 55°F; and electric cables keep the medium cozily warm, for it is said that plant hormones function best at 65°F or over. I now propagate plants the year round, and since last spring have grown several hundred lilac, a few thousand azalea, and even more holly cuttings, as well as some of other shrubs. However, in my opinion no structure is needed for summer propagation—just a mist system and some protection against the wind so that the mist will fall where it is wanted. As I recall, at the last meeting of the Plant Propagators Society, a paper was presented telling how cuttings were grown in upper New York State on a very large scale in full sunlight.

Readers may be interested to learn that the propagating range of The New York Botanical Garden has its own mist system, employing an electronic leaf. Editor

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EASTERN AZALEAS (from page 104)
difference betwen platinum and lead; but the finest forms are being propagated by progressive nurserymen, as the rooting of soft cuttings gradually becomes routine. The day may not be too distant when these decorative shrubs will be recognized everywhere for the important part they can play in gardens.

A CONCISE ENCYCLOPEDIA OF WORLD TIMBERS. ed. 2. F. H. Titmuss. 264 pages, illustrated, indexed. Philosophical Library, New York. 1959. (Published by The Technical Press, London.) $15.00.

A REVIEW

***By* William L. Stern**

Dr. Stern is Curator, Division of Woods in the Department of Botany, Museum of Natural History, Smithsonian Institution.

A BRIEF INTRODUCTION is intended to acquaint the layman with some of the facts essential to an understanding of the main part of the text. It includes sections on tree growth, anatomy of softwoods vs. hardwoods, naming of timbers, identification of timbers, and a short glossary of terms. The bulk of the text consists of descriptions of 224 woods arranged alphabetically by a common name. These descriptions may cover geographic distribution of the species, common names, general appearance of the wood (figure, grain, texture, luster), physical properties, workability, effect of preservatives and natural durability, and features useful in macroscopic identification. A number of descriptions are accompanied by low-magnification photomicrographs of the cross section of the wood. The bibliography contains works where further information may be obtained. An index to scientific and common names terminates the volume.

It is very difficult to be at all enthusiastic about author Titmuss' book, for there is little to induce elation. The introduction (incidentally it is the same as that in the 1949 edition), which includes the section on tree growth, indicates a certain lack of basic understanding of plant physiology and plant anatomy. Titmuss misleads his readers by inferring that the growth of a tree depends only on the action of the vascular cambium. Certainly meristems at the apices are highly important in this regard. A number of enigmatic statements appear in this section. For example, what is meant by, "It is by means of the cells that the tree nourishes itself . . ."? Later, the author indicates that it is the wood which conducts food in the plant. Food is conducted not by the vascular elements of wood, but by the sieve elements of the phloem.

The meaning of, "The wood parenchyma cells . . . form internal walls inside the original cells" is puzzling and certain to be deceptive. Walls are formed in cells as part of the regular process of growth and not by some means unassociated with the growth of the cell itself. The term *vessel* is not synonymous with *pore*—the latter term is one of convenience used to indicate the transverse aspect of the vessel. In another section we read, "Each individual vessel is called a *vessel member* . . . and originates from one cell in the cambial tissue." This statement is entirely contrary to accepted morphological terminology. A vessel is a tubular structure composed of a number of cells. The latter are variously designated as vessel members, vessel elements, or vessel cells. These components of the vessel are each derived from a single fusiform cambial initial.

Among the descriptions of the woods are a number of statements which leave the informed reader incredulous. "It (the timber called mora) is closely related to the Mulberry [see next entry] as it is the product of *Mora excelsa*..." The next entry is *Morus*. *Morus*, the mulberry, is a member of *Moraceae*, not *Leguminosae* as is the genus *Mora*! Further on we read, "This timber (raulí) is of the same botanical family as the true beech . . . The *Betulus* species, however, do not occur in the Southern Hemisphere, and raulí is the product of *Nothofagus procera*." To what genus author Titmuss refers when he mentions *Betulus* is questionable. *Betulus* is probably an adjectival form of *Betula* (*Betulaceae*). Most likely he should have cited *Fagus*.

Many of the photographs are so lacking in detail that nothing more than the pores are distinguishable (e.g., balsa, canarium, Central American cedar). In other instances it is obvious that the sections to be photographed were unequally illuminated, for one portion of the illustration is over-exposed while another portion is under-exposed (e.g., African mahogany, mansonia, Queensland maple). In all honesty it must be stated that some of the illustrations (e.g., Scots pine) should never have been printed.

Literature citations always lack the date of publication and frequently only the authors' surnames are listed. Outdated works are sometimes given in

(Continued on page 124)

The Painter Arboretum about 1870— it is now part of the John J. Tyler Arboretum.

THE JOHN J. TYLER ARBORETUM HAS AN HISTORICAL BACKGROUND

By **Dorothy Ebel Hansell**

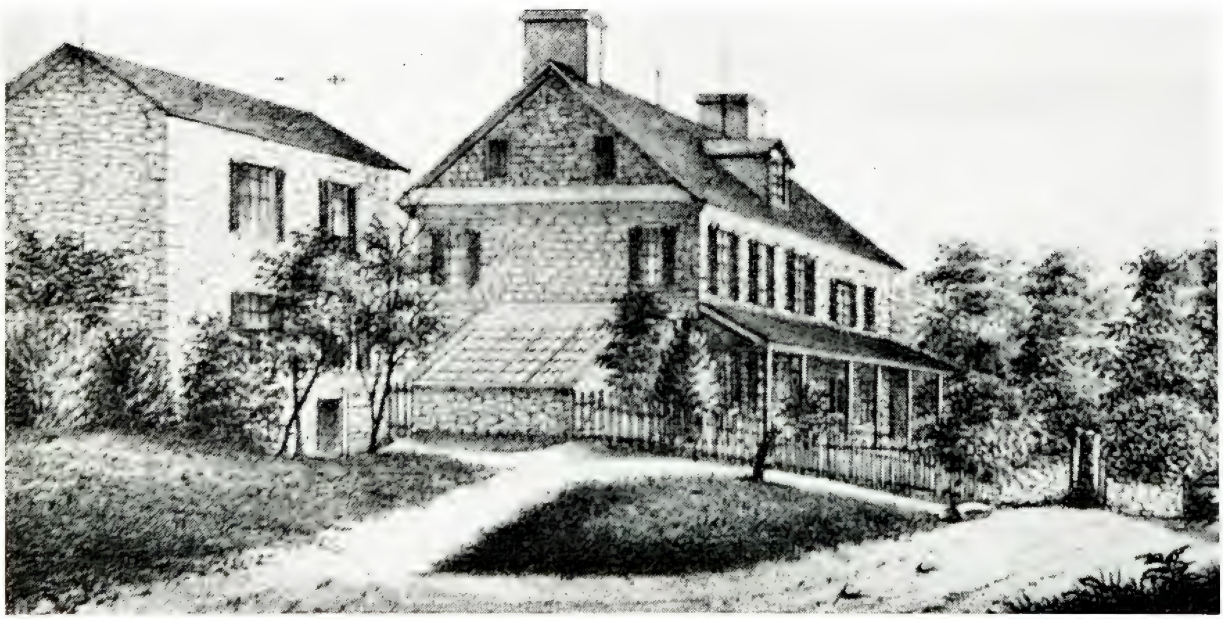
MORE THAN one hundred years ago, two brothers, Minshall and Jacob Painter, undertook a remarkable planting project. Within a period of thirty years, 1845-1875, they planted nearly a thousand different species and varieties of trees and shrubs on their property near Lima, Pennsylvania, which had been in their family for seven generations. The original grant of land was made to Thomas Minshall in 1681 by William Penn and remained in the possession of Minshalls, Painters, and Tylers until 1945.

Minshall and Jacob Painter were sons of a Quaker farmer who supplemented the family's income from farming by importing rum from the West Indies and exporting wheat to those islands. The two men had little formal education and spent their lives as farmers. But through personal observation and extensive reading, they became well versed in the natural sciences and, being in comfortable circumstances, were able to indulge in their hobbies—books and trees and minerals and insects. Collecting and studying minerals and insects, they sent some of the specimens to the Smithsonian Institute and housed others in their own museum—a sturdy stone structure with built-in, fire-proof, and air-conditioned vaults. They also studied the weather and transmitted their observations to the Smithsonian Institute.

For almost two hundred years before Minshall and Jacob Painter began the planting program on their six-hundred-and-fifty-acre farm, oaks, chestnuts, beech, maples, hickory, and tulip-trees had been cut for lumber or taken down to clear land for farming. The two Painters not only planted trees, but they let Nature reclaim some of the cleared land. Sweet gum, sour gum, and dogwood, whose seeds were probably carried in by birds; tulip-tree, red maple, and ash, whose winged seeds were brought in by the wind, appeared again on the farm fields of what is now the John J. Tyler Arboretum.

It was bequeathed to trustees in 1945 by Mrs. John J. Tyler, who carried out her late husband's wishes that the land become an arboretum for the use of the public. Mr. Tyler was the son of Minshall and Jacob Painter's sister, Ann, and Mrs. Tyler was the granddaughter of their sister, Sarah.

When the trustees persuaded Dr.

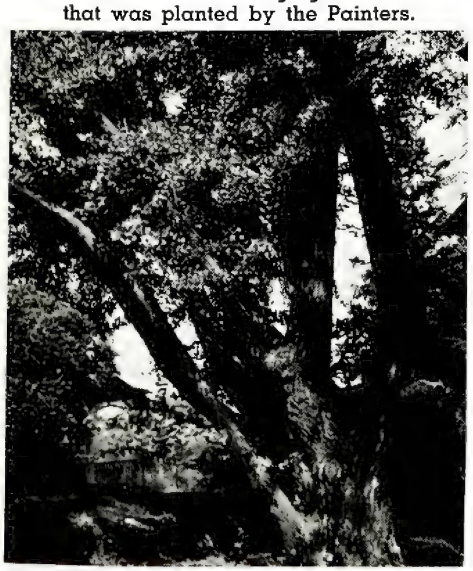


The old Minshall-Painter homestead in the time of the Painters.

Looking upword into a towering Canadian hemlock, *Tsuga canadensis*, one of the original trees planted by the Painter brothers.

John C. Wister to assume directorship of the John J. Tyler Arboretum in 1946, he was confronted with a jungle —a thickly crowded mass of trees and shrubs so entangled with briars and wild grape, honeysuckle and poison-ivy that he could hardly force his way through. From the time of Jacob Painter's death in 1876, much of the property had been neglected, except for tenant farming and firewood cutting.

This is the bole of the gingko, *G. biloba*, that was planted by the Painters.



The giant sequoia, *Sequoiadendron giganteum*, is one of the prized trees in the Tyler Arboretum.

Dr. Wister's No. 1 problem was to get rid of the vines in the woods—and this remains a continuing and costly battle. Gradually areas are being reclaimed, and trails are being opened with the aid of Boy Scout troops. At present, some twenty miles of trails wind through beautiful woodlands and fields. These trails are important, too, for access in fighting fires.

It was also necessary to spray some of the field and other areas to free them from honeysuckle and poison-ivy. This

All that is left of the huge osage-orange, *Maclura pomifera*, which was full of fruit when Hurricane Hazel blew it down in 1954. The twisted trunk has been kept because of its size and because children love it.

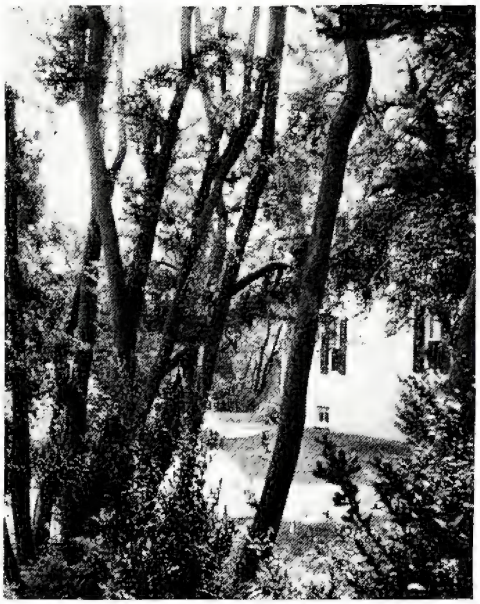
This magnificent tree, *Cryptomeria japonica*, was planted by Mrs. John Tyler about 1930.

operation in a small section of the old Painter arboretum, where a wild flower garden is being made, resulted in a one hundred per cent kill. However, within three years a host of wild flowers — asters, boneset, Solomon's seal and Solomon's plume, dentaria, Jack-in-the-pulpit, May-apple, bloodroot, and others— have sprung up.

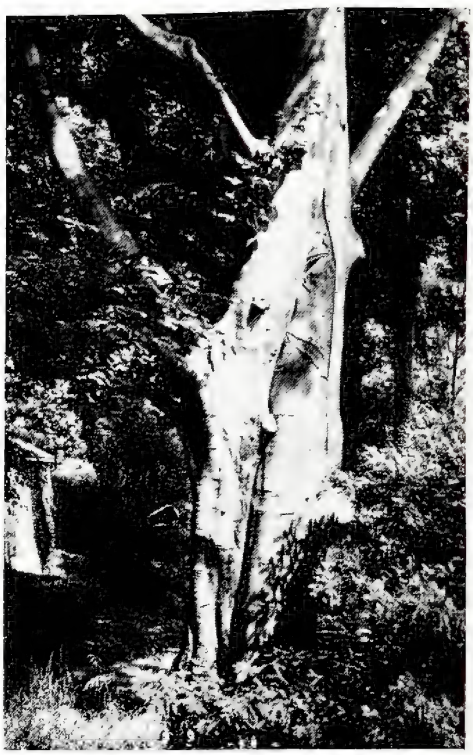
Most of Dr. Wister's attention cen-

Ivy trails over the "knees" of bald cypress. Ivy and also myrtle, *Vinca minor*, have been growing luxuriantly in the Arboretum for over a hundred years.

The front of the old Painter mansion is now used as a museum and meeting place.



The trunks of aged box, their bare branches green with algae, furnish a unique screen.



The trunk of the magnificent European beech (*Fagus sylvatica*) in the "old Painter arboretum."

tered in the beginning on the restoration of the five-acre "old Painter arboretum," that contained Minshall's and Jacob's closely planted collection of trees and shrubs. This meant removing dead and injured specimens and carefully pruning the rest. Today there are about one hundred and twenty-five species of those originally planted by the brothers. Among the survivors are a many-trunked Chinese gingko, a huge cedar of Lebanon, a magnificent European beech, a pond cypress, a towering bald cypress with many "knees," a giant mossy-cup oak, a superb specimen of American holly, the rare Japanese cryptomeria, and an Oriental spruce, now a majestic one-hundred-foot-high tree. Perhaps the most notable of all the trees the Painters planted is the giant sequoia, *Sequoiadendron giganteum*. Over a hundred years old, this specimen has a circumference of nine feet and a height of fifty feet or so —a long way to grow before reaching the height of two hundred and fifty feet which *S. giganteum* attains in the Sierra Nevada Mountains of California. Six each of the giant sequoia and of the cedar of Lebanon were planted here between 1856 and 1864, but only one of each stands—fine specimens to which anyone could point with pride.

Still flourishing are the cottonwood, *Populus deltoides*, though it is seldom that this tree lives so long, and a large coliseum maple, *Acer cappadocicum*, that the Painters bought from the Josiah Hoopes Nursery in West Chester, Pennsylvania, in 1860. The coliseum maple is a native of the west shores of the Caspian Sea, and one may wonder how it found its way to Hoopes nursery. Hoopes was an enterprising young man, keenly interested in unusual plants, and he imported many from France. The Painters were among his

The old, ivy-covered springhouse.

A fine specimen of *Parrotia persica*. This tree, a native of Persia, is infrequently planted, although it is hardy in the North and has brilliant fall foliage.

The section that is being planted with rhododendrons, azaleas, and mountain-laurel, as it looked in September 1959.

The great barn has been strengthened, but the exterior walls remain untouched. The upper floor is used for lectures and flower shows; the lower floor accommodates trucks, tractors, and other equipment, a tool room and workshop.

Another view of the great barn.

best customers and bought many trees and shrubs from him—among the latter, the Chinese *Mahonia bealei* in 1860. It is now a specimen fully ten feet across and seven feet high. In the winter of 1958-59, it was buried beneath a heavy mantle of snow, but came through this ordeal well.

From the specimen of *Paulownia tomentosa* that the Painter brothers planted and Hurricane Hazel in October 1954 ruined, a young tree is now developing. The largest specimen of the willow oak was also destroyed by Hurricane Hazel, which played havoc with the Arboretum, but others are coming along. There are many young trees of the Virginia pine that the two men originally planted. There is a beautiful *Oxydendrum arboreum* growing out of the large stump of one of the early specimens; also an old specimen of

Franklinia (Gordonia) alatamaha. This enchanting tree, discovered in Georgia in 1765 and later cultivated in Bartram's garden in Philadelphia, has not been seen in the wild since 1790.

Minshall and Jacob Painter also set out quite a few magnolias, including the fragrant *M. denudata* from China

Left. A path along one of the terraces in the fragrant garden for the blind.

Below. A Braille label in the garden for the blind.

This particular serpentine barren is called "Pink Hill" because of its lovely color in spring, when it is carpeted with the blooms of the ground-pink, *Phlox subulata*.

and *M. macrophylla* and *M. grandiflora* from the South: *M. tripetala* and *M. virginiana*, native to the locality, are abundantly represented. *M. grandiflora* did not survive and was replaced recently by the clone 'Bogue'. The latter has been propagated by Harry Deverman of Clifton, New Jersey, from a specimen of *M. grandiflora* that was sent from Florida in 1920 to a Montclair, New Jersey, garden. It survived the severe winter of 1934, so Mr. Deverman decided to propagate it, which he has accomplished by grafts.

Many new plantings have been made in the past fifteen years—thirty-eight different kinds of crab-apples, twenty-four different flowering cherries, fifty varieties of lilacs. An extensive planting of rhododendrons and azaleas, species and garden hybrids, is under way and will be a most attractive section when completed. The collection includes many of the hybrids bred by Joseph Gable and G. G. Nearing, catawbiense hybrids, maximum hybrids, and Dexter hybrids. Later on, some of the Glenn Dale azaleas will be added.

Twenty-five acres have been set aside, near the giant sequoia, for spruces, pines, firs, hemlocks, cedars, junipers, and so on. Four or more specimens each of one hundred different species and varieties of cone-bearing trees are planned to be acquired for the pinetum over a period of some years. Three specimens of a kind will be planted in a group and a single specimen a short distance away. In some groups as, for instance, the Douglas-fir, there may be as many as eight or nine specimens. This planting has been partially carried out.

Five hundred herbaceous and tree peonies in two hundred varieties; about a hundred varieties each of iris and daylilies; more than twenty thousand daffodils of several hundred varieties; and thousands of scillas and grape-hyacinths have been planted in recent years for visitors to study or just enjoy, as they may desire. (The drifts of snowdrops and winter-aconite are from the old Painter plantings.)

The fragrant garden for the blind is a feature near the entrance to the John J. Tyler Arboretum. Its four terraces are planted with shrubs, with herbaceous plants for their spring, summer, or autumn flowers, with culinary herbs, and small bulbs. The local garden club, The Country Gardeners, cares for the planting on the top wall; the Philadelphia Unit of the Herb Society of America, the herb wall; and the West Chester Garden Club, the perennial wall. A hand-rail guides the blind visitors, and labels are written in Braille.

Dr. George Taylor, Director of the Royal Botanic Gardens at Kew, near London, England, visited the Arboretum in October 1958. The dogwoods in their glowing autumnal colors were his delight. He also was charmed with the stretch of woods along Rocky Run where tall oaks and tulip-trees make a canopy for maples, hickories, sweet gum, and beeches, which in turn shelter dogwoods, spice-bush, witch-hazel, cle-

(Continued on page 114)

Quiet pervades this woodland in the Tyler Arboretum.

A Country Housewife's Garden

By Gertrude B. Foster

Mrs. Foster is Editor of
The Herb Grower Magazine

"My hands smell of the
Herblike scent,
Telling what garden
Way I went."
"Marigolds" by Louise Driscoll

IF I HAD approached you with hands onion-scented, would you surmise that I had come from a garden in miniature, whose flowers rival in beauty any of the spring-flowering bulbs? Each of the twenty-five segments of my large rectangular herb garden is a little garden in itself. Some beds are filled with plants of similar scent: lemon-scented balm, lemon basil, lemon bergamot, and lemon thyme; or fruit-scented pineapple sage, apple mint, and the variegated apple mint, known as pineapple mint.

Some plants have the capacity to nullify the scent of others. Parsley or rue nibbled after eating garlic will sweeten the breath. Mustard leaves, if rubbed on hands after they have been working with the onion family, will act as a deodorant.

Unless you knew them well, you would not believe that the ornamental onions could have flowers of such delicate fragrance, so different from the characteristic odor of the leaves. The allium bed is one of the most colorful spots in my herb garden from May until September. It is edged with low-growing *Allium senescens* var. *glaucum* with curly, blue-green foliage and ball-shaped heads of lavender flowers in late summer. *Allium ostrowskianum*, six inches tall and covered with conspicuous rosy heads, is the first species to bloom. Then the chives, in several shades and sizes, begin their show. *Allium schoenoprasum* has a dusty rose form that blends well with garden pinks. Var. *sibiricum* produces blossoms taller than the leaves, which measure from eighteen to twenty-four inches, and is a much lustier plant in appearance than the typical variety.

Allium moly, which looks so much like a species tulip in leaf, furnishes a spot of yellow on the shady side of the bed when in bloom in early June. By the time its loose-flowered heads have gone to seed, the taller *Allium senescens*, which is planted towards the middle of the bed, is starting its long succession of blooms.

The ends of the bed are reserved for two special alliums with thin grass-like leaves and lovely bearded blossoms. They are *Allium flavum,* that has showy bracts below its blossoms of delicate yellow and grows twelve to eighteen inches tall; and *Allium pulchellum* that has two narrow bracts two to four times as long as the deep purple, tumbled umbel. The leaves clasp the narrow scapes; this gives the blossoms an airy look above the slim foliage. Both species bloom in July in my garden. Another wiry-leaved *Allium, called A. caeruleum*, and also listed as *A. azureum*, proved a winter fatality, to my regret. It grew almost three feet tall and produced a few steel-blue balls of flowers the first year; perhaps the situation was not to its liking. I was sorry to lose *A. caeruleum*, because few bulb genera include flowers in the pink-purple range and also in yellow and in true blue, and I'd like to have all the ornamental alliums.

The handsomest allium in the bed is *A. tuberosum*, sometimes called garlic-chives. Its starry white florets in flat umbels have a truly sweet perfume. If the leaves are not disturbed, there is no hint of salad bowl when you sniff the flowers. The leaves may be used in place of chives in seasoning, if only a slight garlic flavor is desirable. The foliage is flat rather than round, eighteen inches to two feet tall in chive-like clumps.

Lack of space prevented my putting the three much-used culinary alliums in the bed. Rocambole, *A. scorodoprasum*, with its bird-like scapes which unwind from a complete circle and remind one of a delicate green French horn or, when the pointed buds are not yet erect, of long-beaked birds standing on one leg, produces bulbils instead of flowers at the top.

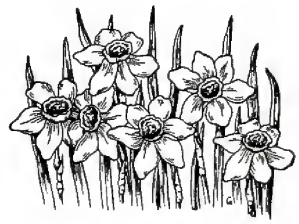
Each curious cluster of minute, strongly garlic-flavored bulbils is wrapped with a long-pointed spathe similar to that of the leek but not so large. New plants can be grown from the tiny cloves, or they can be stored in a brown-paper bag thoughout the winter to press into service when a "little garlic" taste is wanted. The multiplier onion, *A. viviparum*, is too large for the ornamental bed; its hollow stalks are often an inch in diameter and the conical onion-like segments, which appear where flowers should, are as large as onion sets.

Shallots, *A. ascalonicum*, have a row to themselves in the vegetable garden. They are the choicest of all onion seasonings, much used in French cookery. The brown-skinned bulbs are divided into loose sections, somewhat like those of garlic, and each segment will produce a new plant. When the foliage dies down in June or July, the bulbs are ready to be dug. They will keep in dry storage all winter, but some of the harvest should be replanted in the fall for next year's crop.

All the alliums flourish in rich soil. The ornamental species, especially *Allium senescens* and its varieties, will live for many years without enrichment, even on a rock garden site where the soil is thin. The taller, typical *A. senescens* self-sows freely and thus reaches new earth through scattering its seedlings. A bed devoted to *Allium* species must receive a topdressing of well-rotted manure and compost or shredded bark and commercial fertilizer every spring. Bulbous plants tend to push up towards the surface during the end-of-winter thaws, so extra covering with new soil or mulch helps to protect the roots.

There are many more interesting and beautiful alliums which I hope to collect through the years. Many of my favorites came to me from Helen M. Fox, horticulturist and author. I remember walking through the rock garden on her former estate, "Foxden," and asking about the bearded *A. flavum* and *A. pulchellum* then in bloom. Mrs. Fox pioneered in this field, as she did with lilies years ago. Her book, *The Years in My Herb Garden*, describes the most attractive species. When the choicest of plants were transferred from "Foxden" to Mrs. Fox's lovely new garden at Mt. Kisco, the ornamental alliums were not left behind.

For botanical identification of *Allium*



species, consult the four-part monograph, "The cultivated alliums," by Dr. Harold E. Moore, Jr., (*Baileya* 2: 103-113, 117-123; 3: 137-149, 156-167). The differences between the bulbous and rhizomatous types are discussed. The latter includes *A. senescens,* whose leaves remain green during flowering and after the seed heads are cut back.

TYLER ARBORETUM (from page 112)

thra, azaleas, and viburnums.

To see that well-loved old plants are properly cared for and choice plants added to augment the collections—this is the motivating spirit of Dr. Wister, Director, Miss Gertrude Smith, the Assistant Director, and the Trustees of the John J. Tyler Arboretum, in keeping with a fond motto of Minshall and Jacob Painter—"The Genius of Progress, onward and upward."

SPACE GARDEN (from page 91)

gardening this figure will be considerably reduced.

Alga growing is quite simple. A small amount of chlorella, seeded in a suitably aerated glass water container and fertilized with a 10N-5P-1K mixture, will rapidly increase in growth and attain a cell density of two to three grams per liter in a week.

In addition to nitrogen, phosphorus, and potassium, chlorella requires magnesium in amounts equal to that of potassium. The other elements, with the exception of iron, are required only in the trace amounts found in tap water. Chelated iron at the rate of five ppm is usually required, since the pH of the suspension tends to go basic and ordinary iron solutions precipitate above pH 7.0.

The algae are in a sense shade-loving plants. A thin suspension requires about 500 foot candles of light. As the suspension increases in density, the light intensity may be increased up to 4-5000 f.c. Chlorella grows well under fluorescent light or sunlight. The food value of chlorella is quite high. A rapidly growing suspension has a protein value of about seventy per cent on a dry-weight basis. As the suspension becomes dense and ages, the fat and carbohydrate contents of chlorella increase, while the protein value decreases.

It is not difficult to grow chlorella with a thirty per cent protein, forty per cent fat, twenty per cent carbohydrate, five per cent fiber, and five per cent ash content. This ratio is considered ideal from a balanced diet standpoint. The algae, however, are probably deficient in the sulfur-bearing amino acids.

Dried chlorella has an aroma like newly harvested alfalfa meal. In cooking, not all of this aroma is removed. However, astronautical crews will be supplied with a variety of recipes for cooking algae and the necessary condiments to vary the algal taste.

Actually, it is not expected that algae will be the sole source of food for space crews but merely the food staple, with a decreasing amount of supplement as the length of the trip increases.

Orbiting space stations, lunar observations, and the like will have more elaborate gardens in which, in addition to algae, a variety of broad-leaved plants will be grown for food and oxygen production.

Some of the plants under consideration are leaf lettuce, cabbage, collards, mustard, chard, spinach, turnips, carrots and beets. These plants have been selected because they are compact and have relatively large leaf areas for efficient photosynthesis, mature in a relatively short period of time, and are highly edible.

While the broad-leaved plants are generally low in protein, this problem can be overcome by using a high-protein alga as part of the diet.

The over-all problem of the "broad-leaf" garden is much more complex than the alga garden. The algae grow in a liquid medium and can utilize either solar radiation or fluorescent illumination, but many of the broad-leaved plants will not survive in fluorescent illumination. The beet is one of these.

Supplying moisture to broad-leaved plants becomes a major problem in weightless or zero-gravity conditions. Orientation of the root and shoot does not seem to be related to a gravitational field, however. The shoot can be oriented by blue light, while root distribution is controlled by oxygen gradients and soil density.

The problems of maintaining man and plant in outer space are numerous and complex. Difficult as they are, we shall see both successfully completing their space missions before the end of the next decade.

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A "must" for all orchid enthusiasts! This book fully explains the facts behind successful growing practices which lead to better hybrids, larger seedlings, and improved growing conditions. Gives a wealth of information on orchid structure, classification, physiology, genetics, etc. **Edited by Carl L. Withner, Brooklyn Botanic Garden.** *Chronica Botanica New Series of Plant Science Books, No. 32. 1959. 140 photos, drawings; 625 pp.* $14.

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Fresh, exciting views of many of the best known flowers in American gardens—peonies, orchids, roses, lilies, etc. For each flower, the author provides a translation of its Chinese name and explains its symbolism, its use in gardens and homes, and its introduction to the West. Illustrated with reproductions of original Chinese drawings and paintings. **By H. L. Li, Morris Arboretum.** *Chronica Botanica: An International Biological and Agricultural Series, No. 19. 1959. 68 ills.; 240 pp.* $6.50

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BOOK REVIEWS

CEYLON TREES. T. B. Worthington. Illustrated, indexed. Colombo Apothecaries' Co., Ltd., Colombo, Ceylon, 1959. Rs 40 = $8.50.

Ceylon Trees is a collection of 229 black and white photographs of branches, flowers, and fruits of many of the trees of Ceylon. Added are local names in several dialects and languages and data on the origin, characteristics, and uses of the plants. The photographs are of excellent quality, and all are of the same magnification, showing the foliage approximately one third of natural size. The frontispiece, a map of Ceylon, has been divided into three environmental zones — arid, dry, and wet — and local distributions are given in these terms as well as in terms of specific provinces and locations. An index is supplied both to the local and generic names of the plants.

The author has followed the sequence of Trimen's *Flora of Ceylon.* Species are arranged according to plant family, and no keys or descriptive groupings are supplied for the amateur. The value of this book, therefore, is for the professional botanist who may lack herbarium material or other illustrative material of the species listed in Trimen's Flora. The author, however, knows his plants well and has supplied critical information on leaves when they are young and mature, on variations in bark appearance with the age of the plant, and on colors and odors of flowers and fruit. Such characteristics are difficult to obtain in existing floras of Ceylon.

A perusal of *Ceylon Trees* reveals many species commonly cultivated in sub-tropical Florida and tropical America. By his descriptions Mr. Worthington indicates that there are still additional species in Ceylon which may profitably be tried for their ornamental value in the New World.

RICHARD A. HOWARD, *Director*
The Arnold Arboretum
Cambridge, Mass.

FAIRCHILD'S DICTIONARY OF TEXTILES. Stephen S. Marks (Edited by). 627 pages. Fairchild Publications, Inc., New York, N.Y. 1959. $25.00.

"Dictionaries are like watches; the worst is better than none, and the best cannot be expected to go quite true"

SAMUEL JOHNSON

It is either the soft–or very hard-headed who edit dictionaries. The more mundane would be staggered by the complicated task. Words, like everything else, are not immutable. Their meanings grow and change with usage. Nowhere is this more true than in the shifting world of mercantile fashion; for here words are chiefly coined as selling gimmicks rather than exact descriptions. "Meteor crepe" has nothing to do with our space age but was a satin-back crepe popular in the days before World War I. "Madras" is now any number of plain-woven cottons manufactured many thousands of miles from the Indian province of Madras.

The recently published Fairchild's *Dictionary of Textiles* has been well described some two centuries ago by Dr. Johnson. Compiled by members of the staff of the celebrated Fairchild trade paper publications it shows, not surprisingly, a wide range of definitions from excellent to inaccurate. The intrepid editor, Stephen Marks, has in his introduction modestly marked the pitfalls of his editorship. Unfortunately he has not outlined a positive approach to the definition of fabrics. Both Mr. Marks and many of his predecessors have often been content with the description of outward appearance. The more valid characterization of construction, manufacture, and use is frequently bypassed. Anyone in search of definitions must consult several dictionaries for these answers. However, dictionaries of fabrics have been published, and many more will be published to add to our foggy knowledge.

Today the terminology of the fabric business and other fashion industries is a great grab bag of prejudice, misinformation, loose interpretation, and just plain ignorance. Any attempt to bring order from this chaos is to be welcomed. Eventually we shall be able to build a literature of exact meanings and pertinent definitions.

ROBERT RILEY
Director, Industrial Research Div.
Brooklyn Museum
Brooklyn, N. Y.

NITROGEN METABOLISM IN PLANTS. George C. Webster. 152 pages, illustrated, indexed. Row, Peterson and Company, Evanston, Illinois. 1959. $3.50.

This is an excellent pocket-size paperback book, with chapters on amino acid metabolism, biosynthesis of amides and peptides, protein and nucleic acid metabolism, and nitrogen metabolism in the intact plant. Advances with other organisms, from bacteria to animals, are given ample due, although higher plants never leave the center of the stage. This unpretentious book can be heartily recommended to botanists staggering under the burden of costly gigantic "handbooks" of plant physiology and biochemistry doomed to speedy obsolescence and penetrable only with concentrated prolonged study.

The reviewer hopes that this venture will be well supported, so that more of these handy (not "hand"!) books will be published and in large enough printings to permit low cost.

S. H. HUTNER
Haskins Laboratories
New York, N. Y.

PHOTOBIOLOGY. Robert W. Newburgh (Edited by). 90 pages, illustrated. Oregon State College, Corvallis. 1958. $2.50.

Photobiology is a compilation of the papers presented at the 1958 Biology Colloquium held at Oregon State College. The speakers were from Pacific Coast colleges and universities. The subjects covered such biologically important questions as plant growth responses to light, photoperiodism in plants and animals, visual pigments in animals, chlorophyll, and photosynthesis.

Each topic was ably covered by one or more speakers. The subject of a periodic response of plants and animals to an external stimulus, which has received relatively little attention in the past, was discussed by Drs. Went, Farner, and to some extent by Hamner. As pointed out in the papers, it may be that the study of the photoperiodism is fundamentally a study of a natural "internal clock." Those who do research in photoperiodic response need to consider this point more seriously. The energy transfer of sunlight to the reduced carbon atom was the subject of Dr. Bassham's paper. The many different types of visual pigments in animals were discussed and a new classification of them proposed by Dr. Crescitelli.

The papers are well presented and illustrated. As each paper is a different topic, any one of them can be read without reference to the others.

PHILIP H. PLAISTED
Boyce Thompson Institute
for Plant Research, Inc.
Yonkers, New York

AN INTRODUCTION TO BACTERIAL PHYSIOLOGY. Second Edition. Evelyn L. Oginsky and Wayne W. Umbreit. 443 pages, illustrated, indexed. W. H. Freeman and Company, San Francisco. 1959. $7.50.

The authors take, as their basic premise, that virtually every bacteriologist is a bacterial physiologist to some degree and that all should be acquainted with the field. With these thoughts in mind, they have constructed a text for advanced students designed to illustrate their thesis. This has been accomplished admirably. The book examines the manifold activities of bacterial populations and cells in a logical sequence of nineteen chapters divided into six sections. The text is well written, edited, and illustrated.

The reviewer has never been a fan of the tendency to indulge in fanciful illustrations — a feature of the biological texts put out by Freeman and Co. The section on the biochemical pathways of intermediary metabolism is rather trite and repeats similar sections in a score of advanced texts on biochemistry and physiology.

All in all, the book is a valuable text for a beginning course in bacterial physiology. Its use in this connection will be extensive. It is not, nor does it pretend to be, a substitute for the laboratory and the field—a fact that instructors should keep firmly in mind.

RICHARD M. KLEIN

CYTOLOGY AND CYTOGENETICS. Carl P. Swanson. 596 pages, illustrated, indexed. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1957. $13.35.

Dr. Swanson has written a most useful text which effectively summarizes many of the recent developments in the field. The emphasis is on the chromosome. The book presents lucid expositions of the various theories of chromosome structure and behavior. The last quarter of the book is of particular interest, as it deals with the implications of cytology in evolution.

There are forty-six pages listing references. A significant part of these are to works published within the previous ten years, thus attesting to the rapidity with which the field has grown. Therefore, it is perhaps inevitable that some of the more traditional and descriptive aspects, viz., gametogenesis and embryo sac development, receive little attention.

Dr. Swanson is the William D. Gill Professor in Biology in the Johns Hopkins University.

THEODORE M. BARKLEY

METHODS FOR STUDYING SOIL MICROFLORA-PLANT DISEASE RELATIONSHIPS. Leander F. Johnson, Elroy A. Curl, John H. Bond, Henry A. Fribourg. 178 pages, illustrated, indexed. Burgess Publishing Co., Minneapolis. 1959. $3.50.

This little, modest, sturdy, loose-leaf-bound book, notwithstanding the limitation expressed by its title, should be useful to botanists newly aware that the bacterial population of a crumb of soil comprises a fantastically numerous and varied collection of biochemical specialists, some attacking re-

(Continued on page 122)

NEWS, NOTES and COMMENTS

Sir Oliver and Lady Leese were guests of The New York Botanical Garden on February 9, 1960. They have a remarkably extensive collection of cacti and succulents in their nurseries at Worfield in Shropshire, England. They are also co-authors of the fascinating book, *Desert Plants—Cacti and Succulents, in the Wild and in Cultivation,* published in 1959 by W. H. & L. Collingridge, Ltd., England, and by Transatlantic Arts, Inc., 1960, in the United States.

Mrs. William C. Steere, wife of the Director of The New York Botanical Garden, was hostess at the luncheon in honor of Sir Oliver and Lady Leese. T. H. Everett, Assistant Director (Horticulture) and Curator of Education, was the master of ceremonies. He recalled his first experience with cacti and succulents, when he was assigned to the cactus and succulent house during his training at the Royal Botanic Gardens, Kew. He had looked upon these plants as dull and uninteresting — they did not grow much, they didn't flower often. But in the thirteen months he had charge of the cactus and succulent house, he learned that they do grow and change considerably, that they are different from season to season, and that some bear very beautiful flowers.

Sir Oliver related how he became interested in these desert plants, when he commanded thirty corps in the campaign in North Africa under General Montgomery. Later, he succeeded General Montgomery in command of the Eighth Army in Italy. In the closing days of the Burma campaign, Sir Oliver was Commander-in-Chief of the Allied Land Forces.

Upon retirement from the army in 1946, Sir Oliver engaged in growing mushrooms commercially at his Shropshire farm. Cacti and succulents were more intriguing, however, and though the collection was originally started as a hobby, the hobby soon developed into a consuming interest — in which Lady Leese shares enthusiastically—and a profitable nursery business.

Sir Oliver and Lady Leese have studied these plants in their native habitats in Africa and America, as well as in botanic gardens and nurseries all over the world.

Thank you, Grace Meleny. Those of us who are acquainted with the daily activity in the Museum and Administration Building of The New York Botanical Garden have noted the regular arrival of someone new. Who is she who marches through the halls like clockwork, twice weekly, with arms full of papers, boxes of index cards, typewriter, handbag, and sundry paraphernalia, and heads for the last inconspicuous, unmarked door on the right wing of the main floor?

Her name is Grace Meleney. She has a B. A. from Mt. Holyoke College, an M.A. in zoology from Columbia University, and has recently retired as a successful and beloved teacher from the biology department of Theodore Roosevelt High School in the Bronx, New York City. Miss Meleney's interests and hobbies are many, varied, and commendable. For most of her life she has been a bird bander—an avocation facilitated by a dozen ingeniously fitted traps in the shrubs and trees of her garden at White Plains, New York — with many "repeaters" caught, banded, released, and catalogued. Perhaps it is this feeling for the accurate, the pigeon-holing, and the "statisticking," coupled with an inherent love for all that is in nature, including children, that moved Miss Meleny to volunteer her services not only to the Garden, but also to UNICEF.

As the owner of a cottage on Martha's Vineyard, Grace Meleney has observed the invertebrate life of the seashore and also discovered some of the same Cretaceous plant fossils that the late Dr. Arthur Hollick had so thoroughly studied and described earlier in the century. Upon her first visit to the paleobotany collection of The New York Botanical Garden, Miss Meleney saw her great chance of contributing actively to scientific endeavor. She has for the past eight months become the most faithful volunteer in cataloguing the fossil plant collection of some twenty thousand specimens. If there should be a lull in bird banding on weekends, Miss Meleney is fortified with homework from the Garden.

Her former students are elated when she returns occasionally for substitute teaching. Who says the age of retirement is one of decline?

Thank you, Grace Meleney, for your generous contribution of time and effort. Palaeobotany is well served with every facet added to its growing edifice.

HERMAN F. BECKER

Dr. Eugene Jablonski has been engaged for the past several months in research on the *Euphorbiaceae* at The New York Botanical Garden, enjoying in his retirement the pursuit of botany in which he majored at the University of Breslau. World War I enveloped Europe shortly after Dr. Jablonski received his degree. He enlisted in the Austrian army and saw service in Russia.

At the end of the war, no one seemed particularly interested in a botanist; but, as Dr. Jablonski had minored in geology at the University, he was successful in obtaining employment as a geologist with Socony Vacuum and came to this country in 1925. In Socony's foreign service, Dr. Jablonski traveled extensively. At the time of his retirement in 1957, he was chief geologist.

Dr. Jablonski has been appointed Honorary Curator of Tropical Botany in appreciation of his annotating the Garden's type specimens of the *Euphorbiacea.*

Dr. Jablonski's earlier research on the *Euphorbiaceae–Brideliae* was published in *Der Pflanzenreich.*

Activities of the Director and Staff. Dr. William C. Steere, Director, has attended the following meetings during the past several months: Selection Committee of the Woodrow Wilson National Fellowship at Princeton, N. J.; Committee on Institutional Grants of the American Cancer Society, at New York City; Board of Directors of the Horticultural Society of New York at New York City; Committee on plans for the meeting of the American Association for the Advancement of Science in New York City this coming winter, at Washington, D.C. Dr. Steere talked before the Kiwanis Club of the Bronx and the Rotary Club of the Bronx on The New York Botanical Garden. He was accompanied, at these luncheon meetings, by Robert F. Kolkebeck, Assistant Director (Administration) and Business Manager; Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer; T. H. Everett, Assistant Director (Horticulture) and Curator of Education; and Henry

Sir Oliver and Lady Leese with Robert F. Kolkebeck, Assistant Director (Administration) and Business Manager of The New York Botanical Garden, between them, enjoy their conversation with John Devlin of *The New York Times.* At the left is John R. Whiting, Publisher of *The Flower Grower Magazine.*

de la Montagne, Assistant Director Emeritus and Secretary of The New York Botanical Garden.

Dr. Richard M. Klein, Alfred H. Caspary Curator, participated in seminars at Yale University and at Union Carbide Research Institute, on "Effects of Radiation on Plant Growth."

The Development Section of the American Zoological Society, the Society for the Study of Development and Growth, and the new Developmental Section of the Botanical Society of America are arranging for a symposium on "Activation of the Metabolic System in Development" during the meetings of the American Institute of Biological Sciences at Stillwater, Oklahoma, in August 1960. Dr. Klein represents the Botanical Society on the Symposium Committee.

Dr. Marjorie Anchel attended the meetings of the American Society of Biochemistry in Chicago, held in conjunction with the meetings of the Federation of American Societies for Experimental Biology.

Dr. Nalini Valanju is doing research under Dr. Anchel in the Research Laboratory on a National Science Foundation grant.

Dr. Arthur Cronquist, Curator, attended an indoctrination meeting in Washington, D.C., for directors of 1960 Summer Institutes for high school students. The meeting was sponsored by Science Services for the National Science Foundation.

Dr. P. P. Pirone, Plant Pathologist, addressed the Management Section of the American Gas Association in Pittsburgh, Pa.

Dr. Clark T. Rogerson, Curator of Cryptogamic Botany, engaged in research at the State Museum in Albany, N. Y., for several days.

Dr. Herman F. Becker, Visiting Research Associate, completed a major paper on the Mormon Creek flora under his grant for research on the Ruby flora of Montana from the National Science Foundation.

Dr. Caroline K. Allen, Visiting Research Associate, made successful visits, between October 1959 and February 1960, to the herbariums at Harvard University, the National Museum, the University of Michigan, the Chicago Museum, and the Missouri Botanical Garden, to select supplementary specimens, not represented in the Herbarium of The New York Botanical Garden, for loan; and also for type material. These visits were made by Dr. Allen in pursuit of her research on "American *Lauraceae*: Taxonomy and Geographical Distribution" under a grant from the National Science Foundation.

Dorothy Ebel Hansell, Editor of *The Garden Journal*, attended the preview of the garden show of the Long Island Nurserymen's Association at Westbury and the spring flower shows in Philadelphia and Boston, and visited the Arnold Arboretum in Jamaica Plain and Cambridge, Mass.

1960 Summer Institute for High School Students at The New York Botanical Garden will start on July 11 and continue through August 12. Dr. Arthur Cronquist, Curator, will direct the Institute, and George Schwarz, biology teacher at the Forest Hills Senior High School, will be the assistant director. Mr. Schwarz also teaches in New York University. Members of the Garden's staff will serve as instructors, and there will be guest instructors whose names will be announced later.

The Eastern Trial Grounds of the American Dahlia Society is to be located at The New York Botanical Garden. An agreement between the Garden and the Society was arranged by T. H. Everett, Assistant Director (Horticulture), with the approval of the Director, and the officers of the Society.

Bertrand E. Pitt, President of the American Dahlia Society, stated that the Society is happy to have such an accessible location for its Eastern Trial Garden. The trial garden has had three locations in its forty-five years. For the first thirty years, it was located at the Connecticut State Agricultural College, now the University of Connecticut. For about the next five years it was at the New Jersey Experiment Station at Rutgers University, New Brunswick. For the past ten years, it has been located at the New York State Agricultural and Technical Institute at Farmingdale. During these years, many new dahlia varieties have been certified as being worthy of introduction to the American public. It is at these trial gardens that teams of expert judges score each variety on the official A.D.S. score card several times each season. If the average score of the judges rates a variety at eighty-five points or over, then an A.D.S. Certificate of Merit is awarded to the originator; the dahlia is listed in the yearly consolidated listing of the eight trial gardens; and its name and description are published in the November issue of the *American Society Bulletin*. A report of the Certificate winners will be made available to the Editor of *The Garden Journal*.

Entries in the Eastern Trial Garden are not limited to members of the American Dahlia Society. Anyone, including members of The New York Botanical Garden may send three roots, or three greenhouse-rooted plants to Louis P. Politi, Horticulturist at The New York Botanical Garden, Bronx Park, New York 58, N. Y., before May 15. The entrance fee is $4.00 per variety.

Entry blanks may be had from Mr. Politi, or from Henry Olsen, Chairman of the Trial Garden Committee of the American Dahlia Society, 48 Clement Avenue, Elmont, Long Island.

Lynn B. Dudley, Editor of the *American Dahlia Society Bulletin*, who has taken a lively interest in the "dahlia crescent" at the Garden during the years of 1958 and 1959 and contributed dahlia species as well as varieties to the Garden's collection, was instrumental in bringing together the Society and the Garden on this new program.

Visitors are welcome to view the Eastern Trial Garden, as well as the named, older varieties that are planted separately. The dahlias will be in bloom from about the last of August until frost.

Edward B. Lloyd of Montclair, New Jersey, a member of The New York Botanical Garden, has been appointed to the Board of Consultants of the 1964 New York World's Fair. Mr. Lloyd, who has been in the highway construction and maintenance field since 1913, will serve with the group concerned with parkways through the Fair grounds, the floricultural displays, and indoor exhibits.

A past president of the American Dahlia Society and for many years chairman of its trial gardens, Mr. Lloyd is now serving as the chairman of the Society's golden anniversary exhibit at the 1964 World's Fair.

Paul F. Frese has been appointed Director of Public Information and Education at Sterling Forest Gardens near Tuxedo Park, New York. Mr. Frese was editor of publications at the Brooklyn Botanic Garden and formerly editor of *Flower Grower*, and is well known as a writer and lecturer.

Sterling Forest Gardens have appointed Charles A. Lewis Chief Horticultural Supervisor and Martin Flayter Supervisor of Landscaping and Maintenance. Mr. Lewis

The crescent-shaped border of dahlias at The New York Botanical Garden.

has done research in snapdragons and chrysanthemums for Yoder Bros., Barberton, Ohio, and has won acclaim for his displays of chrysanthemums in the Channel Gardens of Rockefeller Center and at the International Flower Show. Mr. Flayter has landscaped many of the private estates and public parks in Orange and Rockland Counties, New York, and for twenty-four years was associated with the New York State Department of Agriculture and Markets.

Petroleum from the Air. Dr. Frits Went, in addressing a meeting of the American Association for the Advancement of Science this past winter and in his paper, "Organic Matter in the Atmosphere and its Possible Relation to Petroleum Formation," published in the February 1960 issue of *Proceedings of the National Academy of Science of the United States of America*, expressed his belief that the blue haze associated with smog in Los Angeles and other metropolitan areas consists of volatile hydrocarbons and similar substances given off by plants. Brought down from the sky by rain and snow to the silt and clay bottoms of streams, lakes, and rivers, these substances are eventually converted into oil.

The former theory that oil was formed from the remains of sea creatures and marine organisms has been discarded in recent years, as chemical studies indicate that oil originates from land plants.

Dr. Went, who is Director of the Missouri Botanical Garden in St. Louis, stated that the pungent odor in sagebrush areas of western United States is due to the volatile organic particles produced by sagebrush and carried into the atmosphere. He estimated that the total weight of the airborne substances of the world's vegetation, which eventually find their way into the recesses of the earth, is one hundred and seventy-five million tons annually—sufficient to account for the oil resources of the world.

Torrey Botanical Club. Dr. Seymour Shapiro, of the Brookhaven National Laboratory, lectured on "Factors Controlling the Growth of Preformed Roots in the Stem of the Lombardy Poplar" before members of the Torrey Botanical Club in Larkin Hall, Fordham University, on April 5, 1960. Dr. Shapiro spent several months as consultant to the U. S. Atomic Energy Commission exhibit at the World Agricultural Fair in New Delhi, India.

On May 10, in Schermerhorn Hall, Columbia University, Dr. Arif El-Ani, of Columbia University, will discuss "The Genetics of *Sordaria fimicola* and the Evolution of Homothallism and Heterothallism in Fungi." On May 24, Dr. William C. Steere, Director of The New York Botanical Garden, will lecture on "Botanical Research in Arctic America." The lecture will be preceded by dinner in the Snuff Mill Restaurant at the Garden.

The Society for Economic Botany will hold its first annual meeting on May 21, 1960, at Purdue University, Lafayette, Indiana. On May 22, a symposium on "Integrated Research in Economic Plants—Drugs and Essential Oils" will take place. Among the subjects to be presented will be: "Problems of Exploration" (search for plants of potential value) by Dr. Richard Evans Schultes of the Botanical Museum, Harvard University; "Agronomic and Genetic Studies of Plants of Significance—Crop Development" by Dr. P. K. Knowles of the Department of Agronomy, University of California, Davis; "Problems of Chemical Isolation" by Dr. Robert F. Raffauf of Smith, Kline and French Laboratories, Philadelphia; "Biological Activity Screening: for Drugs" by Dr. K. K. Chen of Eli Lilly and Company, Indianapolis; "Activity Screening: for Essential Oils, Value Determination" by Dr. N. K. Ellis of Purdue University Agricultural Experiment Station.

American Horticultural Council and American Horticultural Society have merged into one organization under the latter name. The merger became effective in January 1960. Officers elected to serve for the current year are: Dr. Richard P. White, Washington, D.C., president; Dr. Donald Wyman, Jamaica Plain, Massachusetts, first vice-president; Stuart Armstrong, Washington, D.C., second vice-president; and Miss Olive E. Weatherell, secretary-treasurer.

The directors are: (1960) Dr. Donovan S. Correll, Carl W. Fenninger, Dr. W. H. Hodge, Dr. A. J. Irving, Dr. William C. Steere; (1961) Stuart M. Armstrong, Dr. John L. Creech, William H. Frederick, Jr., Mrs. Francis Patteson-Knight, Dr. Donald Wyman; and (1962) Frederic P. Lee, Dr. Henry T. Skinner, George H. Spalding, Dr. Richard P. White, and Mrs. Anne Wertsner Wood.

The *National Horticultural Magazine*, a quarterly, will be continued under the new name, *American Horticultural Magazine*; and the *Gardeners' Forum* will be published eight times a year.

The American Horticultural Council has functioned for fourteen years basically as a federation of more than one hundred and twenty organizations interested in various phases of horticulture. The original American Horticultural Society has been basically an organization of about five thousand individual members with a few affiliated associations and societies. Through the merger, the efforts and facilities of both organizations will better serve American horticulture.

Innisfree Garden in Millbrook, New York, opened to the public on April 30, 1960, and will be open on Saturdays, 10 a.m. to 4 p.m., and Sundays, 1 p.m. to 5 p.m., through June 26, 1960. In 1955 Mrs. Walter Beck established Innisfree Foundation, which is dedicated to the study of garden art, in memory of her husband, the late Walter Beck. Mrs. Beck died in December 1959.

The very fine planting at the Junior and Senior High School, Cornwall, New York.

Innisfree Garden, built by Mr. Beck, is one of the outstanding examples of garden art in the Americas. Design schools and garden clubs desiring to visit the Garden by special appointment, should address the Trustees, Innisfree Foundation, Millbrook, New York.

The present trustees are Wellington R. Burt, Battle Creek, Michigan; Lester Collins, Washington, D. C.; Francis D. Rogers and Watson Washburn, New York City; and George L. Stout, Boston.

Arnold Arboretum, Jamaica Plain, Massachusetts, has been designated a National Registration Center for new cultivars of ornamental plants with the exception of the genera *Camellia, Fuchsia, Hibiscus, Ilex, Rhododendron,* and *Rosa,* which are assigned to other organizations. The Arboretum has been accredited as a Registration Center by the American Association of Botanic Gardens and Arboretums, to which the responsibility to act as a National Registration Authority was assigned by the American Horticultural Council.

Requests for registration and registration blanks should be sent to Dr. Donald Wyman, Horticulturist, Arnold Arboretum, Jamaica Plain 30, Massachusetts.

"Home Gardens in the Northeast, 1620-1860" is the title of the thirteenth seminar on American culture to be given by the New York Historical Association at Cooperstown, N. Y., July 10-16, 1960.

The course will feature illustrated lectures on garden design in northeastern United States prior to the Civil War and the plants grown in these gardens. It will describe the outward appearance of early American homes and their settings in town and country. A survey will be made of historic British and European prototypes in order to understand the origin and trends of these early American gardens. A field trip is planned.

Dr. Clement Gray Bowers, plant scientist, author, and lecturer, will conduct the course.

As this is an afternoon course, it could be combined with any one of several morning courses: American Furniture to 1850; Pioneer Village Crafts; Advanced Techniques in Genealogical Research; or Conservation of Museum Materials.

The Junior and Senior High School of Cornwall, New York, was one of sixteen schools in the United States to win, in 1957, a national architectural citation from *School Executives Magazine.* The jury of noted judges, in awarding the citation, stated: "commended for preserving and developing the special natural beauties of the site."

The Greater Cornwall Association worked closely with Robert Reimann, landscape architect, who designed the courtyard garden. Mr. Reimann is associated with Sargent, Webster, Crenshaw, and Folley, A.I.A., of Syracuse, New York. The planting was done by Newburgh Nurseries, Inc.

The Cornwall Garden Club, a garden club member of The New York Botanical Garden, has contributed plants and money to further advance the landscaping program.

The statue is an original by Winslow Eaves, Head of the Department of Fine Arts, Syracuse University.

SPRING FLOWER SHOWS

That the public loves flowers and flower shows is a statement no one who watched the throngs at the 1960 spring shows in the Coliseum, New York City, in Convention Hall, Philadelphia, and at Wonderland Park, Revere, Massachusetts, would dispute. Attendance at the International Flower Show, which was constructed in the midst of a very heavy snowfall, was slim on the opening day, March 5; but when the show closed on March 12, it could boast of a record-breaking attendance of two hundred and twenty-five thousand. Snow also hampered the opening of the flower show in Philadelphia, and attendance was below normal the first two days; but on Wednesday, March 9 — and, I understand, thereafter until the closing date of March 12—it was almost impossible to get near enough to the exhibits to be able to study them. The Massachusetts Horticultural Society had to take its eighty-ninth New England Spring Flower Show outside of Boston proper—Mechanics Hall, where the show had been held for many years, was demolished two years ago to make way for a large cultural center that will take five years for completion. Cold weather and huge mounds of snow, which caused traffic to move slowly, did not dampen the enthusiasm of flower lovers, who flocked to Wonderland Park in such large numbers on Sunday, March 13, that the Show Committee opened the gates well ahead of the scheduled hour.

After forcing my way through the crowds at the Boston show on Sunday afternoon—all I was able to get was a bird's-eye view —I returned to the show before its opening hour on Tuesday morning to take notes, only to find that the grandstand and clubhouse were already filled with visitors. And though it was a business day, there were many men as well as women.

In past years, flower shows were spectacular, and visitors gazed in awe at the dramatic, colorful displays. Today's flower shows are more realistic, more "down to earth," to give Mr. and Mrs. Home Owner the opportunity to observe what they can do with their own piece of land. At the New England Flower Show, exhibits were definitely keyed to this purpose: a small formal garden (Mrs. B. Preston Cutler) with lawn and terrace, and clumps of tulips, azaleas, rhododendrons, and dogwood; informal plantings of bulbs, rock garden plants, and azaleas around a waterfall and pool, and of native plants and groundcovers along a brook and pool (Arthur Leiby's Nursery and Kelsey - Highlands Nursery, respectively); an informal patio garden (Bartlett Gardens) planted with low-growing shrubs and bulbs, and enhanced by a little pool and the facade of a rustic building. Any one of these could be copied in whole or in part on someone's property. So could the naturalistic (Weston Nurseries) garden, with its delightful small plantings of rhododendrons, azaleas, andromeda, daphne, primroses and little bulbs; it won the President's Cup for the most meritorious exhibit in the show. The intimate, informal garden (Littlefield-Wyman) happily illustrated the merging of two ways of life—suburbia with rural. Here a lawn surrounded by evergreen and flowering shrubs ended in a brick terrace with barbecue equipment; beyond lay the natural countryside.

The gold-medal herb garden of the National Association of Gardeners (Boston Branch), which was designed by Percy I. Merry, had several distinctive features: a wattle seat, a skep, a topiary yew sundial. Among the many medicinal, fragrant, and culinary herbs, some were in flower—dianthus, foxgloves, madonna lilies, heliotrope, dwarf and climbing nasturtiums. Plants in flower are not often seen in herb gardens at flower shows. The National Association of Gardeners had two other exhibits. The gold-medal informal garden (Cape Cod Branch) featured two old specimens of *Pinus rigida*, a border of lilies, peonies, columbines, dianthus, and candytuft, and a statue of St. Francis in a frame of evergreens. In the silver-medal rose garden (Newport Branch) there was a fine tree rose, 'Dawn O'Lake', with large flowers of velvety dark red.

The Bulkley Medal of the Garden Club of America for "an exhibit of special merit and/or educational value" was awarded to the excellent exhibit set up by the Department of Botany and Bacteriology of Wellesley College (William Jennings, Gardener). It was a collection of ferns and a demonstration on how they are propagated; the latter was so detailed as to include an artificial prothallium. The Beatrix Farrand silver bowl was presented to Cherry Hill Nurseries for a garden display of beautiful rhododendrons and azaleas; the gold medal of the Pennsylvania Horticultural Society to Alexander Heimlich for "an exhibit of special merit stimulating interest in horticulture." Mr. Heimlich showed how a rock garden, with small waterfall and pool, can be constructed at the corner of a small lawn.

Arno H. Nehrling, Executive Secretary of the Massachusetts Horticultural Society, admires the amaryllis bred at the Gardner Museum.

A corner of the herb garden of the National Association of Gardeners at the Boston flower show.

The meritorious exhibit, "Potted Plants for House, Patio, and Greenhouse," of The New York Botanical Garden at the International Flower Show.

The Garden Club of Philadelphia won a blue ribbon with its "garden expressing serenity" at the Philadelphia flower show.

Other exhibits which impressed us were the pruning demonstration by the Arnold Arboretum; the Exbury azaleas displayed for the first time in this country by Wayside Gardens; the superb tree-peonies by Marinus Vander Pol; the miniature daffodils and other little bulbs, including *Scilla tubergiana, Ornithogalum balansae, Cyclamen coum albidum, C. coum roseum,* and *C. atkinsii roseum* by John Thibodeau; and the attractive display of the Bessie Buxton Branch of the American Begonia Society, demonstrating how begonias can be used as house plants and as accessories in contemporary decoration. Also the educational exhibit of cacti and succulents (F. I. Carter & Sons) in which plants, in flower, of *Kalanchoe fedtschenkoi marginata tricolor* and a hybrid kalanchoe, 'Radiant Red', and of *Euphorbia bojeri* and *E. keysii* were effectively employed as accents to brighten the fifty-foot long, table-high display. Two specimens bearing the common names of "long telegraph pole from California" and "corncob cactus" caught the fancy of a group of boys from a private school. The former bore no botanical name—or it may be that I was unable to find the label; the latter was labeled *Euphorbia mammillaris.* All the specimens were healthy, and so crisp and clean that they looked as though they had been scrubbed. The exhibit merited the gold medal it received and the special award from the Massachusetts State Department of Agriculture.

Though I dislike large blooms—any flowers just grown for size, whether dahlias or chrysanthemums or amaryllis—I succumbed to the remarkable amaryllis exhibited by Gardner Museum. There were about seventy-five blooms measuring eight and ten inches across, of strong stem, firm texture, and clear colors; they certainly proved what cultural skill can accomplish. These hybrid amaryllis, bred at the Gardner Museum, received the Antoine Leuthy prize for the best display (commercial or private) of flowering and foliage plants.

I talked for a few minutes about the amaryllis with Arno H. Nehrling, Executive Secretary of the Massachusetts Horticultural Society and Director of Exhibitions. He has a genuine feeling for these plants, as his father, the late Dr. Henry Nehrling, started to grow and breed them when he was Director of the Public Museum in Milwaukee. When Dr. Nehrling moved to Gotha, Florida, he had the opportunity to plant his seedling amaryllis outdoors, and he was able to do so on an even greater scale on his property in Naples, Florida. Dr. Nehrling's hybrid amaryllis were on the market for a number of years. He also raised many kinds of tropical foliage plants.

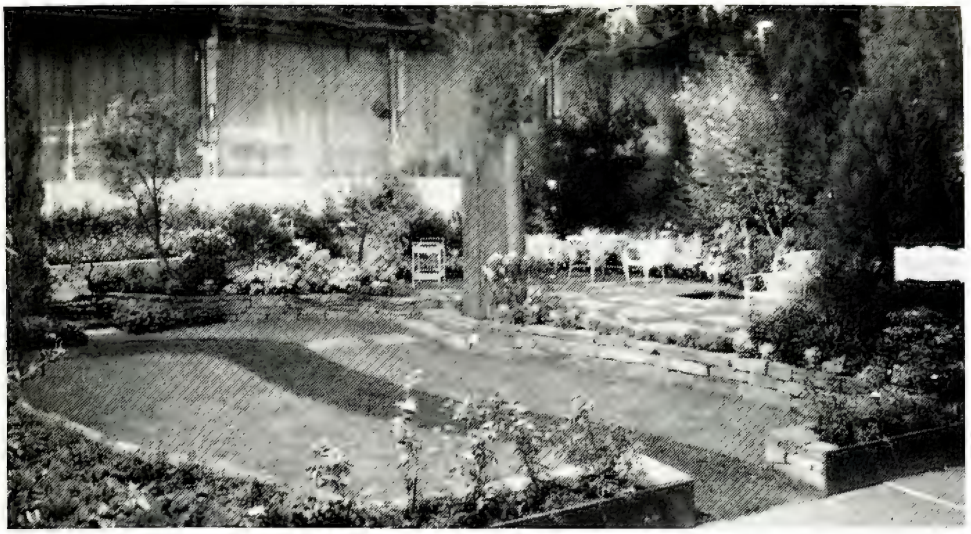
Appropriate to the general theme of the New England Flower Show — the exodus from the city to the country and the development of home properties—was a wildflower and bird sanctuary. This exhibit was the joint effort of the Massachusetts Audubon Society, the Garden Club Federation of Massachusetts, and the New England Wild Flower Preservation Society, to inspire people to preserve a little of the natural countryside and the native plants, and to protect the birds. This fascinating exhibit represented a portion of a backyard in which natural beauty had been encouraged: an old white pine, a red-cedar, grey birch, and dogwood with under planting of junipers, native azaleas, blueberries, ferns, trilliums, violets, Solomon's seal, foamflower, partridge-berry, mosses, and lichens. Such planting saves the vanishing natives and offers shelter to the song birds. There was a redwood birdhouse in this sanctuary of such design as to attract several different kinds of birds.

But what about the flower shows in New York and Philadelphia?

The 1960 International Flower Show was one of the best in a number of years, noticeably improved in the variety and quality of the plant material: the well-grown narcissi in the garden of Mrs. Ricardo Gonzales (James Jack, Gardener); the stalwart tulips in the Sterling Forest Gardens display; the marvelous orchids in the Manda exhibit; the fine roses in the Jackson and Perkins garden. Some of the plants exhibited in the amateur classes for gesneriads, cyclamen, begonias, African violets, cacti and succulents, and orchids were especially commendable.

Outstanding in the opinion of judges and visitors was The New York Botanical Garden's very attractive, educational exhibit of "Potted Plants for House, Patio, and Greenhouse." In conception and execution, this was a "first-class job." Plants in the windows—the show cases—of a low, white house from which one looked out on plants on a patio (moved there for the summer from the small greenhouse), and plants in the greenhouse where they were being grown and rehabilitated—all illustrated how the home owner can use plants to the best advantage in decorating his home within and without. Adding to the exhibit's educational value was the remarkable variety of plants and their high quality, and the printed matter on pot plant culture prepared by Louis P. Politi, Horticulturist, for distribution during show week. To Mr. Politi and his department, and to Vincent Rampino, Superintendent of Buildings and Grounds, and his department belongs the credit for this exhibit which was awarded the Bulkley Medal of the Garden Club of America, the T. A. Weston Trophy, and the Horticultural Society of New York Trophy.

Simplicity was the keynote of the city roof-garden of the Four Counties Garden Club at the Philadelphia flower show.



"Joy of the Waters," the formal garden exhibited by Styer's Nurseries at the Philadelphia flower show, could be readily adapted to a home property.

The Garden Club of America's many horticultural classes were keenly contested; so were the artistic arrangement classes, with the coveted Fenwick Medal being presented on the final day of the show to Mrs. Oliver A. Vietor and Mrs. Gray McW. Bryan of the Rumson Garden Club.

On entering the flower show in Philadelphia, I missed the long vista down the main aisle of Convention Hall—of acacias, of dogwoods, of orchids, as it had varied from year to year. The center of the Hall was occupied by "Dancing Waters," multi-colored streams of water leaping and cascading in rhythm to music. The series of fountains was enclosed within a high wooden fence around which were beds of well-grown, colorful tulips.

The Bulkley Medal of the Garden Club of America was awarded to the Morris Arboretum (Dr. John M. Fogg, Jr., Director) for a "reasonably complete collection of the many cultivated forms of *Hedera helix*," an exhibit which interested the gardening public. Many visitors jotted down cultivar names in their notebooks. Notebooks were in use, too, at the exhibit of pelargoniums—miniature, variegated-leaved, ivy-leaved, scented-leaved—staged attractively by Ambler Junior College of Temple University; this was formerly the Ambler School of Horticulture.

The fragrance garden for the blind of the Philadelphia Unit of the Herb Society of America drew many visitors. The borders, constructed of railroad ties to a level that permitted the plants to be easily touched or smelled, were complete in every detail with Braille labels on the plants and directions in Braille on the guide-rail before a corner. The African Violet Society had a fine display of profusely flowered plants and a demonstration on propagation. The member on duty was kept very busy answering one question after another. The American Gloxinia Society and the American Begonia Society were also represented.

Garden clubs from the suburbs of Philadelphia enter wholeheartedly into the spirit of the flower show — not only in setting beautiful tables with fine appointments and artistic floral arrangements, in keeping with period furniture, and in making artistic arrangements in niches, but in putting together well-designed, small gardens. This year their schedule called for a "section of a garden expressing serenity," and they admirably met the schedule. The gardens were charming, with top honors going to the Garden Club of Philadelphia. Their schedule also called for a "city garden, roof or backyard—some plant containers required as part of the scene." The blue ribbon was awarded to the garden entered by the Garden Club of Wilmington; it was well done. The city roof-garden of the Four Counties Garden Club, that won second place, appealed to me because of its simplicity.

I am interested in native plants, so I always look for Vick's Wildgarden exhibit. This year in a natural woodsy setting of birch, dogwood, rhododendrons, azaleas, and mountain-laurel, water flowed from an old, abandoned springhouse into a brook and tiny pools. Growing in the leaf-strewn floor of the woods were dainty wild flowers—orchids, trilliums, arbutus, hepaticas, violets, ferns, and a host of others.

Across the aisle from Vick's "Joy of the Wild" was "Joy of the Waters" created by Styer's Nurseries. It was a formal garden, dominated by a huge tree whose shade would make the terrace an inviting place on a balmy spring or warm summer day. The little statue in back of the small pool was enchanting. This garden, particularly well designed by someone who has discriminating taste and an appreciation of plant material, could readily be adapted to a good-sized suburban property.

Conard-Pyle's pretty rose garden or "Rose Walk," as it was named, contained over two hundred Hybrid Teas, Floribundas, and Grandifloras. Conard-Pyle displayed also an eight-by-twelve-foot garden, entitled "Suburban Living in Miniature." Everything was built to scale—model ranch-type house, driveway, walks, lake, deciduous and evergreen shrubs, shade trees, and four stepped-down terraces planted with miniature bush and tree roses. Children as well as adults were fascinated by this "doll-size" house and garden.

Doors had hardly closed upon the last visitors to these flower shows before exhibitors began dismantling their displays, trucks carted plants and props away, clean-up squads worked fast to remove debris, show managers and committees tallied their records. Then, within a matter of days, managers, committees, and exhibitors started their plans for the next show. A spring flower show is a full year in the making.

D.E.H.

MORE NEWS AND NOTES

1961 All-America Rose Award Winners are 'Duet', a Hybrid Tea, and 'Pink Parfait', a Grandiflora. These are the fifty-fourth and fifty-fifth roses to win this award since the testing program was initiated in 1938, indicative of the fact that rose introductions must pass high standards of vigor, disease-resistance, form, color, and so on, in the All-America trial gardens which are located in various parts of the United States.

'Duet' is a bi-color, in which the soft salmon-pink of the inner surface of the petal blends with the rosy crimson of the reverse. 'Pink Parfait', the third in the Grandiflora class (established five years ago) to win the All-America Rose Award, bears numerous flowers, shading from dawn-pink to deep rose, on a large and vigorous plant.

The New York Botanical Garden has been designated an All-America Rose Selections Garden, where the All-America roses may be seen.

Above. Grandiflora rose 'Pink Parfait'.
Left. Hybrid Tea rose 'Duet'.

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BRIMFIELD GARDENS NURSERY
245 Brimfield Road Wethersfield, Conn.

New Garden Mums. Bristol Nurseries, Inc. is introducing a little button-type chrysanthemum, 'Chocolate Drop'; its oxblood-red to chocolate-maroon flowers are borne on long sprays, nice for cutting. Their other new varieties include 'Flaming Pillar', a late-flowering decorative; 'Moonlight Spoon', an early-flowering spoon variety in soft primrose; 'Sparkling', another decorative, in rose-geranium pink; and 'Bronze Gremlin', an early-season walnut-bronze pompon —a mound of color by September 15.

George J. Ball Inc., is offering "foot-ball" mums for gardens under the name of "Harvest Giants" in white, apricot, golden-yellow, and bronze-red. Cornelius Ackerson, past president of the National Chrysanthemum Society, Inc., and editor of its Bulletin, tested them in his New Jersey garden last year and rates them high.

Dr. Louis Otto Kunkel, plant pathologist of international repute, a member of the Board of Managers of The New York Botanical Garden since February 27, 1951, and of the Scientific Committee since May 1953, died in Newtown, Pa., on March 20, 1960 at the age of 76. Dr. Kunkel had been a plant pathologist with the Rockefeller Institute of Medical Research for a number of years at the time of his retirement in 1950. He established the Division of Plant Pathology at the Institute's former branch in Princeton, N. J., in 1932 and engaged in extensive research on the relationship of viruses to plant diseases.

He was born in Mexico, Mo., and received his Bachelor's and Master's degrees from the University of Missouri, and his doctorate in botany from Columbia University. After a two-year fellowship for study abroad, Dr. Kunkel became a plant pathologist with the Bureau of Plant Industry, U.S.D.A., and later Associate Pathologist for the Hawaiian Sugar Planters' Association on the problem of mosaic disease of the sugar cane. Dr. Kunkel's investigations, while he was on the staff of Boyce Thompson Institute for Plant Research, contributed to the knowledge of mosaic diseases of sugar cane, tobacco, and Indian corn.

The Board of Managers at its meeting on March 21, 1960, adopted a resolution recording its profound sorrow at the death of its associate who had had a long and distinguished career.

Dr. Ezra J. Kraus, well-known plant scientist, died at Corvallis, Oregon, on February 28, 1960, at the age of seventy-four. After he had served as plant physiologist at Oregon State College for eleven years, he joined the staff of the University of Wisconsin in 1917; in 1934, he became chairman of the department of botany at the University of Chicago.

Dr. Kraus helped to develop the weed control spray 2,4-D, did pioneer work on plant growth regulators, and developed new strains of chrysanthemums. Since his retirement in 1949, when he returned to Oregon State College as visiting professor in botany, his interest has centered on the development of new varieties of ornamental plants.

His Chicago strain of chrysanthemums was developed in experiments which he conducted on the Lasker estate in Lake Forest, Illinois. In 1953, Mrs. Albert D. Lasker presented New York City with some five thousand plants of these chrysanthemums in memory of her mother, Mrs. Sara J. Woodard.

Dr. Kraus was the recipient of awards from the Garden Club of America, the Men's Garden Clubs of America, the American Pomological Society, the American Association of Nurserymen, and others. He was a past president of the Botanical Society of America, the American Society of Horticultural Science, and the American Society of Plant Phvsiologists.

Visitors at The New York Botanical Garden in recent months:

Dr. Harve Carlson, National Science Foundation, Washington, D.C.
Dr. A. C. Smith, Smithsonian Institute, Washington, D.C.
Dr. Charles D. Michener, University of Kansas, Lawrence.
Howard S. Irwin, Jr., Dept. of Botany, University of Texas, Austin.
Dr. Ferdinand Bohlmann, Director of Organisch - Chemisches Institut, Technische Hochschule, Berlin.
Boris Anzlowar, Director of the Science Information Center, Ciba Pharmaceutical Co., Summit, N. J.
Beatrice Cashman, Garden Editor, *Better Homes and Gardens*, Des Moines.
Mr. and Mrs. Tugo Tateoka, Japan.
Dr. Paul C. Hutchison, University of California, Berkeley.
Paul F. Frese, Director of Public Information and Education, Sterling Forest Gardens, Tuxedo Park, N. Y.
Margaret Meuse, Sterling Forest Gardens, Tuxedo Park, N. Y.
Dr. William L. Stern, Dept. of Forestry, Yale University, New Haven.
Prof. Kenton Chambers, Dept. of Botany, Yale University, New Haven.
Dr. John M. Fogg, Jr., Director, Morris Arboretum, Philadelphia.
Mr. and Mrs. Alex McDonald, Chatham, Ontario.
Dr. M. A. Johnson, Rutgers University, New Brunswick.
Dr. S. M. Bricks, University of Rhode Island, Kingston.
Mildred F. Petit, Librarian, Kingwood Center, Mansfield, Ohio.
Dr. Robert F. Duell, Farm Crops Dept., Rutgers University, New Brunswick.
Dr. F. R. Forsberg, Washington, D.C.
Dr. Lyman B. Smith, Smithsonian Institute, Washington, D.C.
Dr. Pierre Dansereau, Institut Botanique, Université de Montréal, Montréal.
Dr. R. M. Schuster, University of Massachusetts, Amherst.
Lorna Maitland, artist, London, England.
Luz Valcárcel, Lima, Peru.
Dr. F. W. Kavanagh, Eli Lilly and Co., Indianapolis.
Dr. Joseph Thomas, St. Barnabas Hospital, New York City.
Dr. S. Stevenson, St. Barnabas Hospital, New York City.
Dr. William Klomparens, Research Division, The Upjohn Co., Kalamazoo, Mich.
Dr. L. W. Clausen, College of Pharmacy, Columbia University, New York City.
Dr. S. M. Siegel, Union Carbide Research Institute, White Plains, N. Y.
K. C. Coleman, Union Carbide Development Co., White Plains, N. Y.
H. F. Robertson, Union Carbide Develop- Co., White Plains, N. Y.
Dr. W. J. Crotty, Dept. of Biology, Washington Square College, New York University, New York City.
Dr. Tom Stonier, Rockefeller Institute for Medical Research, New York City.
Dr. N. Valanju, Rockland State Hospital, Orangeburg, N. Y.
Dr. Leonard Piccoli, School of Pharmacy, Fordham University, New York City.
T. M. Traroe, Institut National Hygiene, Conakry, Republic de Guinea.
Dr. K. J. Zozol, Republic de Guinea.
Mrs. Rod Smith, Hobart, Tasmania.

BOOK REVIEWS (from page 115)

sistant high-molecular structures and complicated, rare molecules such as antibiotics and vitamins, resistant metabolites such as plant cell-wally materials, and others producing these antibiotics and vitamins. The book is remarkably up-to-date; e.g., it has a good outline of Lochhead's revolutionary studies of the nutritional interrelationships of the quantitatively most important groups of soil bacteria, and it abstracts directions from recent papers on how to isolate amoebae and bacteriophages. The methods outlined for testing bacteria en masse for antibiotic production are a good introduction for the beginner. There are many well-printed diagrams and illustrations.

Soil science, unfortunately, is something of a museum of physiological antiquities; this moldiness infects portions of the book; thus "Thornton's Standardized Medium" for

isolating soil bacteria and a "modified Crone's solution" for higher plants are set forth. A second edition, cleansed of obsolete recipes, and enlarged to cover such important topics as the measurement of the persistence in soil of chemicals used to control plant diseases, should be warmly welcomed.

S. H. HUTNER
Haskins Laboratories
New York, N. Y.

BREEDING FIELD CROPS. John Milton Poehlman. 427 pages, illustrated, indexed. Henry Holt and Company, New York, N. Y. 1959. $8.50.

The author indicates this book to have been written principally for an introductory course in crop breeding and possibly as a reference book for more advanced students. Stated objectives are review of basic principles, presentation of methods of procedure, breeding of specific crops, objectives and problems and propagation and maintenance of improved varieties. Crops considered are wheat, oats, barley, rice, flax, tobacco, soybeans, corn, sorghum, cotton, sugar beets and forage plants.

The book is ideally suited for a beginning course in field crops breeding. It has been written at the desired level and has excellent coverage of the most pertinent subject matter. The information presented for the various crops has been well reviewed by competent breeders and is well organized. The teacher using the text may need to supplement information at various points, depending upon emphasis, since it is not possible for such a text to be exhaustive.

Numerous illustrations, photographs, and diagrams are excellent and appropriate. Reference lists accompany each chapter and a glossary of technical terms is appended. The volume is a valuable addition to crop breeding texts and should prove interesting and useful to all students of plant improvement.

D. C. SMITH
Department of Agronomy
University of Wisconsin
Madison, Wisconsin

PLANT PHYSIOLOGY, A Treatise. Volume II. Plants in Relation to Water and Solutes. F. C. Steward, editor. xvii—758 pp. Illustrated and indexed. Academic Press, Inc. New York. 1959. $22.00.

The tremendous expansion and complexity of the interlocking disciplines comprising plant physiology has suggested that advanced texts be written by more than one author. Volume II of Professor Steward's *Plant Physiology* is part of a projected six-volume, seven-part treatise on all aspects of plant physiology.

The choice of topics for the volume under review is excellent; the eight authors are all recognized authorities in their respective fields, and the book is very well edited. The chapters are, essentially, long reviews of the literature with an adequate amount of interpretation and synthesis. The research worker and the teacher will undoubtedly use this treatise extensively.

As is true for books on all rapidly advancing scientific endeavors, *Plant Physiology* will soon be out of date. Since identical subject matter is reviewed almost yearly in several "Annual Reviews" as well as in the *Encyclopedia of Plant Physiology*, the cost of this set of books seems excessive.

RICHARD M. KLEIN

COMPLETE BOOK OF HOUSE PLANTS. Andree Vilas Grabe. 126 pages, illustrated, indexed. Random House, Inc., New York. 1958. $2.95.

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With the increasing interest in the use of plants in the home, this book is another must, especially for the amateur. It is designed to give concise and complete information in a clear and understandable manner.

The book is divided into two parts. Part I is devoted to the care of house plants in general, a primer of instructions. Though it contains information similar to that found in many other books, it differs from them in one respect—it deals only with those easily grown in the home, not in the greenhouse.

There are eight chapters each treating a single subject: "The Potting Mixture"; "Pots; Potting, Repotting"; "Light"; "Watering, Washing, Humidity"; "Temperature and Fresh Air"; "Plant Food"; "Pests"; "Propagation."

Part II, by far the more important, is a picture dictionary which gives facts about the care, cultivation, and propagation of nearly three hundred plants, listed alphabetically by their popular, as well as their botanical names. With each plant, there is a photograph and description; the facts are there, easy to locate, and easy to read. The photographs are very clear, and, with descriptions simply and clearly stated, they comprise a fine reference book.

MARY F. JOHNSON
Pompton Lakes, New Jersey

THIS IS NATURE. Richard W. Westwood (Selected and Edited by). Brief notes on 38 authors. 214 pages, illustrated, including line drawings by Walter W. Ferguson. Thomas Y. Crowell Co. New York. 1959. $5.95.

There was a time when magazine subscribers bound their favorite periodicals annually, with shelf-room being no particular problem. But times change and recent years have seen an interesting development — the magazine that becomes a book by having its best or most popular articles reprinted between hard covers. Such is *This Is Nature*, described in the subtitle as "Thirty Years of the Best from *Nature Magazine*." It is an especially appropriate memorial anthology just now, when *Nature Magazine* is going out of existence by being merged with *Natural History*.

Nature Magazine has always held a distinguished place among American magazines devoted to natural history. It has attracted good naturalists and good writers (sometimes but not always synonymous terms) and has published a high percentage of popular yet accurately observed natural history articles as against the amateurish accounts of wild pets which, appealing as they occasionally are, inevitably lower the level of a magazine. Here are articles by Carl G. Hartman, Edwin Way Teale, William Beebe, Robert Cushman Murphy, Alan Devoe, E. Laurence Palmer — to mention only half a dozen out of the almost two-score authors represented. The anthology contains many striking photographs and a good series of the always-delightful drawings by Walter W. Ferguson. *This Is Nature* is a happily-conceived souvenir of a vanished magazine that had many devoted readers.

WILLIAM BRIDGES
Curator of Publications
New York Zoological Society

EVERGREEN AND FLOWERING SHRUBS FOR YOUR HOME. Katharine M-P. Cloud. 248 pages, illustrated, indexed. Greenberg, Publisher, New York. 1957. $4.95.

The many illustrations in this book on shrubs gives the home owner good ideas to carry out on his own grounds. The before and after pictures are especially interesting.

Most of the houses shown are modern and small in keeping with today's trend.

The book is divided in four parts with general cultural directions and ways of using shrubs at the beginning. A special chapter on roses is worthwhile, giving a list of species roses which can be used as shrubs or hedges.

Part 2 is devoted to evergreen shrubs listed alphabetically so that easy reference can be made. A hardiness map at the front of the book explains the zone number following the name of each shrub. Varieties and ways of using them are given in each instance, also pests and how to control them. Propagation methods are specific here, following general rules in the chapter on propagation in Part 1.

Flowering shrubs are treated in the same way in Part 3. One is glad that proper pruning is stressed, and the illustration on page 26 of a twenty-four-year-old forsythia deserves praise for its natural beauty.

The last section is made up of lists which doubtless will prove to be the most valuable part of the book to many gardeners. A long list of shrubs for partial shade is helpful but, again, the question arises what degree of shade. Pyracantha will grow in partial shade but does not fruit well there. Since the berries are its main attraction, one wonders whether this plant should be included in this list. Shrubs for fall color and shrubs to attract birds will interest many. This practical book is worth a place on the gardener's book shelf.

ESTELLE L. SHARP
Berwyn, Pennsylvania

Recent Additions to the Library

Bigger's Handbook of Bacteriology. F. S. Stewart. 611 pages, illustrated, indexed. The Williams & Wilkins Company, Baltimore, Maryland. 1959. $8.00.

Central Desert of Baja California, The. Homer Aschmann. 315 pages. University of California Press, Berkeley, California. 1959. $5.00.

Chemistry of Plant Gums and Mucilages. F. Smith and R. Montgomery. 627 pages, illustrated, indexed. Reinhold Publishing Corp., New York, N. Y. 1959. $18.00.

Grasslands. Howard B. Sprague (Ed. by). 424 pages, illustrated, indexed. American Association for the Advancement of Science, Washington, D.C. 1959. $9.00. $8.00 to members of AAAS.

Grass Productivity. André Voisin. 353 pages, illustrated, indexed. Philosophical Library, Inc., New York, N. Y. 1959. $15.00.

Production of Field Crops. T. K. Wolfe and M. S. Kipps. 5th Edition. 653 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York, N. Y. 1959. $8.50.

A REVIEW (from page 107)
preference to recent publications or editions: e.g., Solereder's 1899 treatise on anatomy is cited rather than Metcalfe and Chalk's 1950 *Anatomy of the Dicotyledons*; Brown and Panshin's 1934 *Identification of the Commercial Timbers of the United States* is listed in lieu of their 1940 or 1949 editions. Pertinent works are omitted in some instances: e.g., Kribs' work on commercial foreign timbers in the United States, Spalt and Stern's recent survey of African timbers, and Little's check-list of the woody plants of the United States. These and other recent publications would have helped the author to make his work really a second revised edition and would have improved his selection of botanical names.

Because the description of each timber begins on a new page, short descriptions occupy only a fraction of the page. The large blank spaces that result are highly distracting and do not improve the appearance of the book. Aside from the addition of a number of new wood descriptions and the photomicrographs, this edition is little improved over the 1949 edition.

The large number of orthographic errors, especially in scientific names, is unpardonable in a second edition. It is disheartening to have to report thus on any published work.

LETTERS TO THE EDITOR

The cover photo of the March-April issue is especially lovely. I've seen the garden when it was as beautiful as its picture.

There seems to be an unusual number of articles of special interest, probably because in one way or another they relate to personal experiences of my own.

Most interesting of all, for this reason, is the article concerning the Meilland rose establishment. When I was going to France in the summer of 1956 as the guest of the House of Houbigant, I expressed a strong desire to visit a perfume factory in Grasse and the Meilland greenhouses at Cap d'Antibes. Houbigant made the necessary arrangements. I was given a letter of introduction to M. Smith of Grasse. In the company of M. and Mme. Smith (he was English, she French) I visited both Grasse and Cap d'Antibes.

Francis Meilland was undergoing an operation the day of our visit, but his father made a most delightful host. He showed us through several of the large greenhouses; then took us to the administration building. There the official photographer showed us many photographs of the Meilland roses.

The cedar of Lebanon at Brimfield Gardens Nursery and the dwarf global-shaped white pine, at the extreme left, are the same age—thirty years old.

While we were in the greenhouses, "Pere" Meilland cut rose after rose, presenting each to me with a friendly smile. Among them was the recently named 'Grace de Monaco' and 'Peace', called 'Mme. Meilland' in France. When we left, I had an armful. As I was leaving the next day for England, I gave the roses to Mme. Smith in gratitude for a most wonderful day—from 9 A.M. to 5 P.M. or thereabouts.

On our return to my hotel in Nice, the skies opened up. It was the first rain in over two months, I was told. The Smiths had reason to be pleased.

Thank you for pleasant memories .

ELISE L. BOWLES
(Mrs. Charles R. Bowles)
Yonkers, New York

I was happy to see Mr. Swift's article "Vizcaya" in the March-April issue of *The Garden Journal*, —and the excellent pictures— but very sorry to note that no mention had been made of the creator of all that beauty, both indoors and outdoors of the villa. It seems to me that Paul Chalfin, my uncle, should have been given a little credit.

"Vizcaya" was his masterpiece: the glorious gardens were all executed under his guidance and from his plans; the art treasures were purchased abroad by him for Mr. Deering and selected to fit the preconceived plan. Mr. Deering had been in favor of Spanish architecture, but Uncle Paul persuaded him to use Italian instead. The choice of the material used for the palazzo (and even the name "Vizcaya") were my uncle's choices. The interiors, also, were the result of his genius — the specially made lighting fixtures, curtains, all small and large details.

When the Dade County Art Museum came into being, Mr. Chalfin was the only one who knew the value and history of "Vizcaya's" contents, and he was thus engaged to make the inventory before it was opened to the public. Mr. Chalfin died a year ago at the age of eighty-six.

BRUCE G. CHALFIN
Plantation Gardens
Rustburg, Virginia

We have a fine cedar of Lebanon here at Brimfield Gardens Nursery. It is about forty feet high and thirty years old, and bore a few cones for the first time in 1958. They were ripe in the fall of 1959. Two squirrels nibbled at the cones the first fall but, finding them too green and resinous, left them on the tree. I got them down ahead of the squirrels this fall and sowed them. I hope they are viable.

The scion, when this tree was grafted, came from one of the trees at the Arnold Arboretum and is of the hardy type. It was raised from seed that Prof. Charles Sargent, then director at the Arboretum, had brought over—some fifty years ago—from the cold mountains of Asia Minor. I am enclosing a picture which may interest readers of *The Garden Journal.*

The cedar of Lebanon becomes a very picturesque old tree, not unlike an old white pine, and should be planted much more frequently than it is.

ROBERT MARSHALL
Wethersfield, Connecticut

ERRATUM: March-April issue, page 73, 4th paragraph, first line, should read "*Monarda didyma* and a third *Monarda,* namely *M. punctata* . . ."

SUTURES FOR A WOUNDED TREE

Another example of Scientific Research at work

A storm sweeps down leaving in its wake a split tree, years of stately growth and beauty shattered in a few minutes. There was a time when the axe was the only solution to this problem but today it is not always fatal. Where the break is not too severe, scientific tree care, like modern surgery, has developed a technique of "suturing" that not only closes the wound but permits the tree to regain its normal strength and vigor. "Sutures" in order to be effective must be promptly and skillfully applied so that the break is sealed against infection and the trunk and large branches sway as a whole, not independently. This exacting process calls for trained technicians and precision instruments which is the reason why "Bartlett" has spent years in the research and development of techniques and materials for this important branch of shade tree care.

Storm damage claims thousands of trees each year many of which could have been saved by proper bracing and cabling. Don't wait until the injury occurs, call a Bartlett Tree Expert today for sound advice on how to protect your valuable shade trees the Scientific Way. His local experience backed by the knowledge and technical advice of the Bartlett Tree Research Laboratories is available for this and all other types of tree problems.

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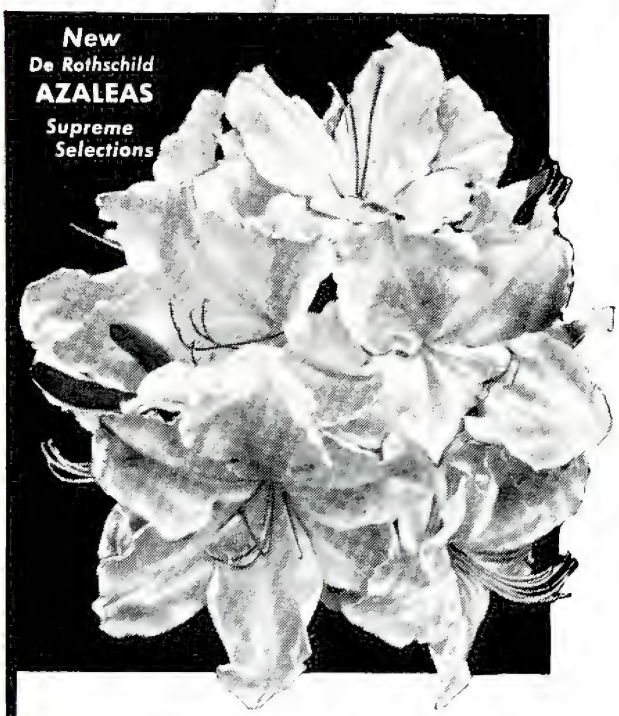

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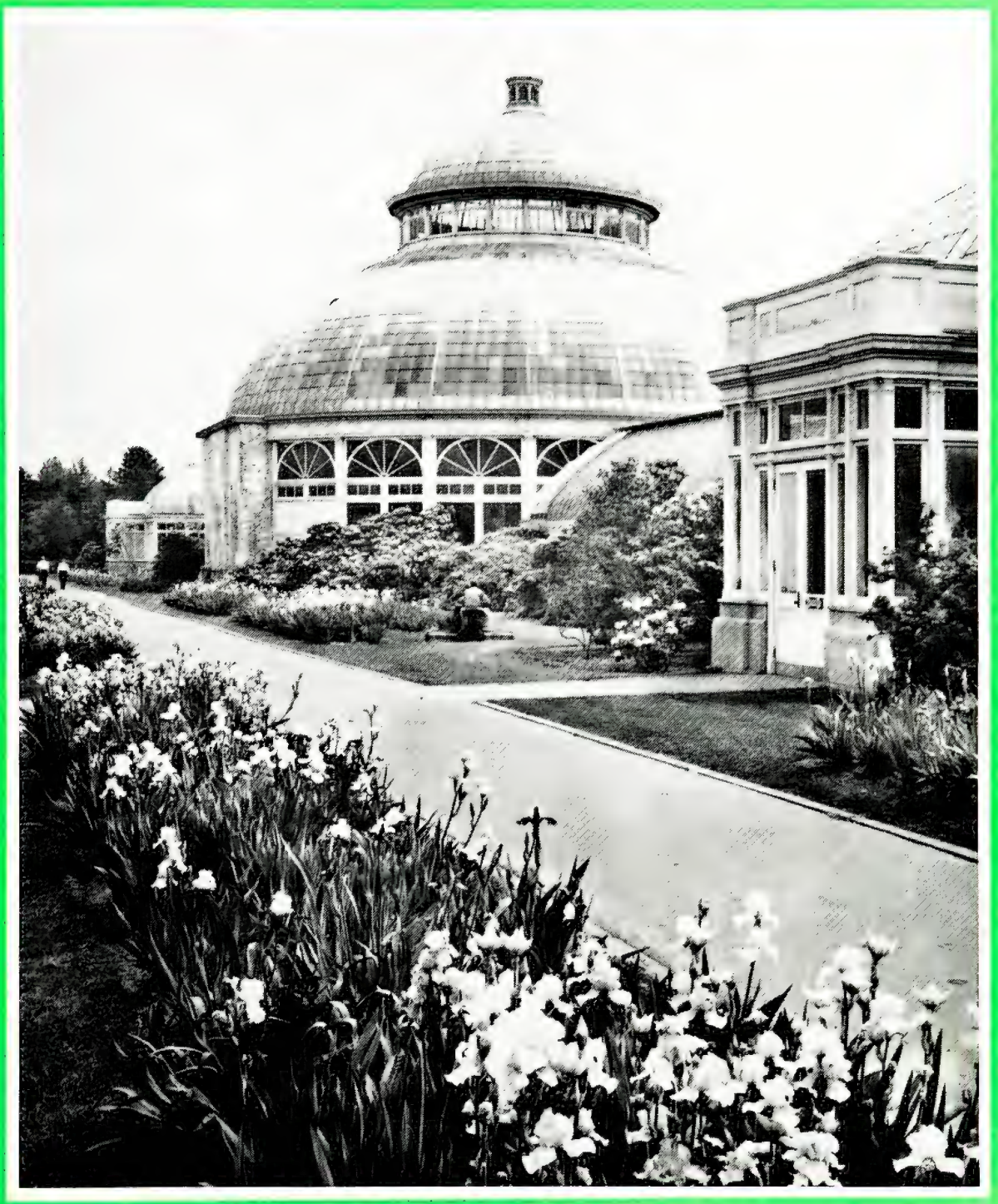

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 4 July - August, 1960

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

NOTICE TO MEMBERS

Have you taken advantage of the 1960 Bulb Offer presented to you through the Special Insert in the May-June 1960 issue of *The Garden Journal?*

Your order should reach the Garden not later than July 25, 1960. If you have not already mailed it, please do so at once, using the order blank provided on pages 104G and 104H of the Special Insert.

ANNOUNCEMENT

During the next several months, the Museum and Administration Building will be rehabilitated. The Library, Herbarium, and Administrative staffs are temporarily quartered in the Research-Laboratory and the Snuff Mill, while contractors renovate the heating, plumbing, and electrical installations, replace the antiquated elevator with a modern self-service one, and make other necessary repairs.

This work will disrupt normal operations to some extent; but the grounds will be open daily, and members of the Garden and the general public will be served by mail and telephone. These improvements, long overdue, will facilitate operations in the future, accommodate the staff more efficiently and comfortably, restore the appearance of the building, and improve service generally.

NEW MEMBERS

The New York Botanical Garden is always happy to add to its membership. If you have a relative or friend who might enjoy the privileges to which membership entitles him, please send his name and address to Mrs. E. Kene, Membership Secretary, The New York Botanical Garden, Bronx Park, New York 58, New York. Mrs. Kene will mail literature and a membership application to him.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, Mrs. Donald B. Straus, for the selection of the front cover illustration –the iris borders at The New York Botanical Garden, photo by E. N. Mitchell; pp 126, 127, E. H. Fulling; p 129—from a sketch by Norman Rines—courtesy of New York Telephone Company; p 131, photo reproduction by E. N. Mitchell of Upper Westchester County map, American Automobile Assn., Washington, D. C., prepared in cooperation with Automobile Club of New York, 1950; pp 133, 134, upper left 135, Olive M. Gunnison; pp 137-140, G. G. Nearing; pp 141, 143, George Spalding; p 144, upper left, All-Year Club of Southern Cal.; p 144, lower right, pp 145, 146, Descanso Gardens; pp 147-149, A. M. Freeman, Jr.; p 155, The New York Botanical Garden; p 156, Bassett Maguire; p 158, upper, E. N. Mitchell, lower, Mrs. Bernard Peyton; p 159, upper left, Ansel Adams—courtesy Mrs. David H. McAlpin; p 159, lower right, p 160 upper left, Israel Office of Information, New York; p 160, lower right, p 161, upper left, Scalamandré Museum of Textiles; p 161, center and bottom, French and Company. Drawings, p 135. **Echinacea purpurea**, p 151, **Equisetum arvense** by Charles C. Clare, Jr.

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YEW TREES AND VINEYARDS OF CROTON POINT

With a History of the Area, Horticultural and Otherwise

By **Edmund H. Fulling**

Dr. Fulling is editor and publisher of *The Botanical Review,* and Honorary Curator of The New York Botanical Garden.

APPROXIMATELY thirty-five miles north of the Statue of Liberty and projecting south-westwardly about two and a half miles into the Hudson River is a peninsula known as "Croton Point." The outer half of it, up to half a mile in width and with a shore line of some four miles, is administered by the Westchester County Recreation Commission as a haven of refuge—with camping, boating, picnicking, swimming, and playground facilities — for thousands who seek momentary escape every summer from the ever increasing congestion of metropolitan living. At other seasons—spring, autumn, and winter—the area is occasionally visited by amateur ornithologists, interested not only in the challenging and elusive vireos and warblers of migration seasons, but also in the bald eagles that may at times be seen on ice floes in the river or in tree tops on the Point.

It was on two such midwinter visits, in vain as far as eagles were concerned, that my attention was attracted by four unusually large English yew trees on the open, windswept plateau of the Point, perhaps five hundred feet from its outer extremity and seventy-five feet above the river. The trunk of one of the trees is eight feet in circumference, those of the others only a foot or two less; all are at least thirty feet tall and in excellent health, with dense foliage and beautifully shaped conical crowns, despite the completely hollow interior of the largest one. Equally impressive is their smooth, thick, and slightly shaggy brown bark, not hard and flinty as on an aged maple or oak, but slightly compressible like the tread on a pneumatic tire. Three of the trees stand within a short semicircular bend at the outermost point of the road on the peninsula; the fourth is across the road. My dubious identification of them all as English yews *(Taxus baccata),* not Japanese *(T. cuspidata),* was confirmed by Dr. George Lawrence, Director of The Bailey Hortorium, Cornell University, to whom a specimen of the foliage of each tree was sent. Although the tree outside the bend in the road differs from the others in having somewhat pendulous instead of stiff, erect, or horizontal branchlets and in not having foliage of a tufted aspect, they all display, as Dr. Lawrence pointed out in his reply, the three salient distinguishing features of English yews, namely, gradually acuminate instead of abruptly pointed leaves and obtuse un-keeled instead of acute keeled winter bud-scales.

How old are these yews and who planted them, these trees that grow wild only in Europe, North Africa, and western Asia? English yews are commonly handled in this country by nurseries today, but specimens of this size are rare. Had they, therefore, been imported from Europe for this particular spot before their kind was in the American nursery trade?

After permission to do so had been obtained from the Superintendent of the Westchester Park Commission, a calculated estimate of one hundred to one hundred and ten years was made for the trees by counting the growth rings on an increment boring extracted from one of them by R. R. Fenska, Dendrologist of the Bartlett Tree Expert Co., White Plains, New York. Mr. Fenska is a frequent visitor at the Garden and the author of the well-known TREE–EXPERTS MANUAL, that is now in its fifth edition.

A Swedish increment borer was provided by Mr. Fenska, an instrument which, by being forcefully hand-screwed into the trunk of a tree, enables one to extract a core of wood, three-eighths of an inch in diameter and up to eighteen inches long, on which growth rings can be counted and annual diameter increments compared. In this manner a ten-inch fragmented core was withdrawn from the tree pictured with this article. By sandpapering the fragments, seventy-seven distinct growth rings were revealed; an additional fifteen years were estimated for the innermost portion of core on which the rings were indistinct. The boring was made about four and a half feet above ground level, and if five to ten years are allowed for the tree to have attained that height, the estimated age of one hundred to one hundred and ten years is obtained. The other three trees, being of similar size, are probably of the same age. How old they all were when planted there is not revealed by any record, but they certainly originated as seedlings somewhere, about the time that Harriet Beecher Stowe was writing *Uncle Tom's Cabin* (1850-1852), that is, before the American Civil War.

Who was living on the Point at that time and who could have been interested in planting English yew trees on an exposed windswept plateau extending nearly halfway across the Hudson River? The answer was easily determined by consulting published accounts and other records in the library of the Westchester County Historical Society, and in so doing, an interesting history of the area—geologically, politically, horticulturally—was revealed. Let us make a long story of it by beginning between fifty thousand and one hundred thousand years ago.

GEOLOGY

At some point in that relatively recent past, geologically speaking, the last great glacial blanket that had previously extended, in this area at least, as far south as Long Island had retreated up the Hudson Valley until its recession was temporarily halted by climatic conditions over a long interval that brought about a balance between formation and southward movement of ice, on the one hand, and melting of the ice on the other. The result was the formation of a terminal moraine for the Hudson Valley lobe of the glacier, and that moraine, or terminal dump of materials

carried by the glacial waters, became the beginning of Croton Point, which today projects so anomalously halfway across the Hudson River from an otherwise unindented shoreline. The moraine dammed the river, and clays from north of Croton Point were deposited in ponded water. That, however, was not all that was going on at the time. A few miles to the east another stream, known today as the "Croton River," was carrying water from the same melting glacier and discharging it into the same Hudson River in the neighborhood of Croton Point. Carrying more water at that time than now, it poured sand, gravel, and rock into the Hudson, upon and in front of the moraine, building it ever higher. The Point is thus the remains of a delta built in the deep Hudson estuary by the Croton River immediately after the recession of the ice front while the region was one hundred and twenty feet lower, or the water level was much higher than it is now. The outermost parts, composed of Croton River deposits on top of clay brought down the greater valley, probably extended at one time much farther than now, but were subsequently cut down by shifting of the Croton River and carried out into the Hudson. Striae upon many exposed rock surfaces and immense boulders scattered over the peninsula constitute mute evidence today of the glacial forces that built up the Point. Most of the rocks are granite, brought from Massachusetts and New Hampshire, while conglomerates with shell fossils came from across the river.

Other geological interpretations of the Point may differ from the foregoing in certain details, but the history as stated here so briefly is sufficiently accurate for present purposes.

Pre-Nineteenth-Century History

The first people to inhabit Croton Point were the Kitchewan Indians, a subtribe of the Mohegans. They called the projection "Senasqua," a term probably derived from their word "wanasqua," meaning a "point." At times it was known to them also as "Senaschal." The chief, or sachem, of the Kitchewans bore a name which meant "The Wind" and was pronounced "Kenoten," "Knoten," and "Noten." It was Kenoten's River that had built up their Senasqua, a name which, by phonetic transcription on the tongues of early European settlers, became "Croton River." To the Point, itself, as we shall later note, the name "Croton" was not applied until the early nineteenth century.

The first white men to behold Senasqua may have been the Florentine navigator Giovanni da Verrazano and his men, who in 1524 preceded Henry Hudson into New York Bay by nearly a hundred years and who may have sailed up the river. History heaps more laurels, however, on the Englishmen, sailing a Dutch vessel, and his Dutch crew of eighteen or twenty men, who anchored their fifty-eight-foot-long "Half Moon" on October 1, 1609, off Verplanck's Point according to one historian; according to another, in Croton Bay itself, probably where reeds, meadows, and railroad yards today dominate the landscape. The palisades along the river that was ever after to bear his name, the wigwams on Senasqua, and the Highlands north of them probably provided a week's outing for Hudson and his men such as he was not to enjoy again, for two years later he perished as the result of mutiny, after having discovered Hudson Bay in his quest for a Northwest Passage.

The first white owner of Senasqua was Cornelius van Bursum, of New York City, who bought it from the Indians in 1682; it may have been he who paid a bottle of rum and twelve blankets for the land, a sale price for it recorded in historical accounts, without the name of the buyer. A year or two thereafter he sold it to Stephanus Van Cortlandt, the wealthy merchant of New York, whose family name is intimately associated with the early history of the metropolis.

Stephanus (born in 1643 in New York City) was the eldest of seven children of an illustrious father who served in many public capacities, including that of burgomeister, or mayor, of New Amsterdam almost uninterruptedly from 1655 until the English conquest in 1664. Stephanus and his brother Jacobus, the youngest child (born 1658), were the progenitors of all the Van Cortlandts of subsequent generations. Jacobus was the founder of the younger or Yonkers branch of the family, whose prominence in the affairs of

One of the four English yews, with an estimated age of one hundred and ten years, still thriving on Croton Point as evidence of horticultural interests in the early nineteenth century by Dr. Richard T. Underhill who became prominent as a viticulturist, manufacturer, and dispenser of wines and as president of the Westchester County Agricultural Society.

New York City became perpetuated in the name of Van Cortlandt Park and in the manorial home that still stands as a museum in Yonkers. Stephanus was the founder of the so-called elder Van Cortlandt branch and served in many noteworthy public capacities under English rule until his death in 1700. In 1677, when, at the age of thirty-four, he was appointed mayor of New York, Stephanus received from Governor Andros a license authorizing him to acquire such lands "on the east side of Hudson's River" as "have not yet been purchased of the Indyan proprietors . . ." He began to carry out this privilege in 1683 by purchasing Verplanck's Point (see accompanying map) and then acquired other parcels from Indians or from whites who had obtained title from the local aborigines. The purchase of Senasqua from Van Bursum, already mentioned, was part of this land acquisition.

In keeping with the colonial regulation of the time, Colonel Stephanus obtained a license in 1692 to purchase Indian property also elsewhere, this time on Long Island, and with that privilege he acquired a long and narrow estate of 1,206 acres at Islip, extending eight miles north from Great South Bay. The year in which a manorial patent covering this land was obtained from William III, King of England, and signed by Colonel Benjamin Fletcher, Governor of New York, Van Cortlandt built a manor house on it and named the estate "Sagtikos Manor" in keeping with the Indian name "Saghtekoos"; to the local colonists it was known as "Appletreeneck." Van Cortlandt soon tired of Sagtikos, however, and he disposed of the property, for his opulence permitted him to exercise his preference for the banks of the Hudson, where he continued to acquire land.

In 1697, after Van Cortlandt's holdings aggregated 87,713 acres on both sides of the Hudson, the whole was consolidated, by royal letters patent from Governor Fletcher and the Crown, into the Lordship and Manor of Cortlandt. Except for two strips of land totaling twenty-one hundred acres above Verplanck's Point, which neither Stephanus nor his heirs ever acquired, the Manor covered the whole of Westchester County to Putnam County, along the Hudson from the glacial moraine and Croton River north to the Highlands, and twenty miles due east to the Connecticut line. As a private holding it was exceeded only by the first and largest of the patroonships in New York, that of the absentee proprietor Van Rensselaer, whose domain, Rensselaerswick, covered almost all of the present-day counties of Albany, Rensselaer, and Columbia. Stephanus Van Cortlandt died at the early age of fifty-seven, only three and a half years after the issuance of his manorial grant.

It was probably in 1683 that Stephanus Van Cortlandt began to construct his manor house on the north shore of the Croton River where it entered Croton Bay. Through Rockefeller philanthropy this historic mansion has been restored and opened to the public within the past year. It is an example of fine living in the days when a wealthy merchant of New York City built his place of retirement in the wilderness of peaceful Indian territory, far away from the congestion of eighteenth-century New York City. In those days a ferry across the Croton River provided the only means of avoiding a wide detour to the north shore, where the mansion still stands. A drawbridge near the Van Cortlandt house, which allowed river steamboats of moderate size to pass, was not constructed until 1865. Today a modern and at times congested highway traverses a bridge over the river and passes the entrance to the grounds of the restoration, entry into which provides a delightful escape from the swirling traffic outside the gate.

In 1671, while Stephanus Van Cortlandt was still a prosperous merchant in New York City and a dozen years before he began to acquire his manorial domain in upper Westchester, his sister Sophia married Andreas Teller, another New York merchant. In 1683, according to one historian and as already mentioned in this article, Stephanus bought Senasqua from Cornelius van Bursum, and shortly thereafter Sophia obtained possession of it. Historical accounts which I examined merely state that Stephanus was instrumental in his sister's acquiring the land; if he actually bought the land, the conclusion is that he either gave or sold it to his sister. In contradiction, I have been informed, but leave it for someone else to confirm or deny, that a deed transferring the land direct from van Bursum to the Tellers can be seen in the Westchester County Court House.

Left. R. R. Fenska, of the Bartlett Tree Expert Co., extracts an increment boring from the tree pictured on page 126.

The trunk of one of the other trees, displaying the slightly shaggy nature of the bark in advanced age, is pictured at right.

Whichever way the land was conveyed, gradually, thereafter, the lovely Indian name Senasqua became only a memory, and for a hundred years or more, through the American Revolution, the area was known as "Teller's Point," a name which appears on some maps of today.

Andreas and Sophia Teller appear not to have lived on the Point because every reference, at least to very early white settlers there, is to William and Sarah Teller; the relationship is not revealed. At any rate, Sarah survived her husband, and the land was known also as "Sarah's Point."

Between the acquisition of Senasqua by Van Cortlandt and the close of the eighteenth century, the Point was the site of social and political events of local interest far beyond the scope of this article. One event, however, merits attention, for it concerned the treason of Benedict Arnold. On the evening of September 20, 1780, Major André, coconspirator in the plot, went on board the British ship of war "Vulture," which had lain some days a little above Teller's Point in Haverstraw Bay. He had gone to Dobb's Ferry from New York on horseback and was being rowed up the Hudson to the ship, when a barge-load of sailors from the "Vulture" rowed to the Croton shore to reconnoitre and to ascertain whether the land was in the hands of the Whigs or the Tories. Two Croton men were making cider on land at the time, armed with muskets for protection against the "Cowboys" and "Skinners," two marauding bands of hoodlums that put fear and trembling into the peaceful colonists of the neighborhood. Spying the boat, they fired upon it, and the seamen retreated to the "Vulture." Not satisfied with their miniature victory, the cider-makers, one of them a negro who had served in General Van Cortlandt's Westchester militia, aroused the neighbors who assembled horses and harness. Thus they were able before nightfall to hasten up the Post Road and out the King's Ferry Road to the little fort on Verplanck's Point under Colonel Livingston.

Their story, related to the Colonel, resulted in their returning with a four-pounder; before daybreak the cannon was concealed on the Point under cover of the underbrush and within firing range of the "Vulture." In the semi-darkness before dawn, a flash and a roar startled the British marines from their slumber, and the first shot of the cannon splintered a spar of the warship. A return shot from the "Vulture" lodged in an oak tree, where it remained for more than half a century, until the tree, which had become decayed, was cut down.

In the meantime, according to one historian,

> "Major André had been rowed ashore before midnight and had arrived already at Joshua Smith's 'treason house' above Haverstraw. History says that he was much agitated when he heard the echo of heavy firing down around Teller's Point, but he was too far away to see the "Vulture" had weighed anchor and disappeared down the river around the Point. The Croton army hitched the heavy farm horses to the light artillery and went home to brag about how they had licked the English navy. But they were wholly unaware that they had thwarted Arnold and André. It was days, even, before they learned of the treason plot."

The American action on this occasion was probably the main factor in Arnold's decision that André should return to New York City by land, a decision that led to the latter's capture and to the revelation of the infamous conspiracy.

Nineteenth Century History

In the first years of the nineteenth century three Underhill brothers — Abraham, Joshua and Robert — were the owners of a flour and grist mill. It was near covered Quaker Bridge on the New York-Albany Post Road over the lower Croton River, at the head of navigation on that stream and about three-quarters of a mile below the present Croton Dam. They were descendants of the famous pre-Revolutionary Captain John Underhill, who had come to America from England in 1630, and they had bought the land in 1792 from Pierre Van Cortlandt, the eminent grandson of Stephanus. It was one of these brothers, as we shall soon note, who was responsible for the yew trees of this account; and two descendants of this son who provided data for this article.

Robert and Abraham attended to the milling operations, while the third brother, Joshua, residing in New York City, was the exchange member of the firm, operating under the name Joshua Underhill & Company, Flour Merchants. The firm did not depend on local farmers for grain, although they did some neighborhood milling, but obtained the bulk of their raw material from New York City and sold most of their produce there. For some years both supplies and products were carried by a two-masted, flat-bottomed "Perry Auger," as a Dutch schooner was called, "of which the owner, Captain, supercargo, pilot, and boss stevedore" was no less a person than Cornelius Vanderbilt of Staten Island. He piloted his boat on high tide up the Croton River to the mill, and returned with flour on a later tide.

In 1841, after half a century of operation, the Underhill brothers discontinued milling, partly because of shortage of water power in times of drought, but primarily because in early January of that year a great flood of water and ice broke through the first Croton Dam at Pines Bridge. The flood carried away not only the Underhill mill, but also nearly every farmhouse in the lower valley. Croton Bay, because of the sand and debris deposited in it by this cataclysm, was closed to use by barges and sloops, and navigability of the Croton for Hudson River vessels was a thing of the past.

In 1804 one of the brothers, Robert, who was born in nearby Yorktown in 1761 and had a home in the gorge of the lower Croton River, bought most of the nearly two hundred and fifty acres of Teller's Point in two parcels: the greater part from Elijah Morgan who had acquired it only four years previously from the Tellers; the other part, a farm, from Robert McCord, the husband or son of one of the twin granddaughters of the Tellers. Twelve acres at the south end of the Point were not included in the Robert Underhill purchase. They were lated acquired by his son Richard, the Underhill who planted the yews. Robert, the father, soon sold his share in the mill on the Croton, long before the disastrous flood, and became a very prosperous farmer on the Point, the first to start cultivation of ordinary farm crops there. More than a hundred years before, Van Cortlandt's acquisition of the peninsula resulted in gradual replacement of the Indian name "Senasqua" by "Teller's Point"; now transfer of the land to the Underhill dynasty gradually replaced "Teller's Point" by "Croton Point."

Wars have always provided markets for certain crops or manufactured prod-

The Van Cortlandt Mansion in Van Cortlandt Park was occupied by members of the Van Cortlandt family for almost a century and a half. Acquired by the City of New York in 1889, it is now a museum open daily to the public.

ucts, and profits for those who could furnish them. So it was with the War of 1812 when it interfered with the supply of southern watermelons to the food markets of New York City. Other northern farmers also very likely took advantage of the demand for these delectable fruits, but Robert Underhill, for one, devoted as many as eighty acres on Croton Point to cultivating them. Apparently, the metropolitan distributors sent their boats up the river to carry Underhill's melons to the big city, or middlemen served as intermediaries, for there are reports that as many as six vessels at one time waited in the Hudson for the crop to ripen.

About the time that he was raising these succulent morsels, Robert Underhill began planting Newtown Pippin apples. Within a few years the Pippins were fruiting so well that some visitors persuaded Robert to send them abroad. He did so, and it was the beginning of an export trade.

That was in the days when children cried for or rebelled against castor oil, and Underhill's next business venture was an attempt to torture them further or satisfy their demands by raising palma Christi plants, as castor oil plants were known at that time. John Hallock, of Egg Harbor, New Jersey, was the patentee of a process for pressing out and clarifying the oil in castor beans, and in September 1821, he contracted to set up a processing plant for Underhill. The business prospered for some years, but then parties in Ohio infringed on Hallock's patent and manufactured the oil on such a large scale as to overstock the market and reduce the price to such an extent that manufacture of it on Croton Point was no longer profitable.

Among the refugees from the French Revolution was wealthy and educated M. Parmentier, who settled in Brooklyn at the beginning of the nineteenth century and planted a large garden with European grapes about his home. The garden later became a commercial nursery, and from it Robert Underhill obtained vines for a vineyard on Croton Point. But European grapes in America were destined to failure, being very susceptible to the ravages of *Phylloxera,* a plant louse, and to three kinds of fungal disease—black rot, downy mildew and powdery mildew. Underhill's initial sortie into viticulture (1827) was, consequently, unsuccessful, but it launched his clan into an enterprise that brought prominence to his two sons and a grandson, after resistant hybrids between European and American grapes became available. The grape industry of the Hudson River Valley thus began with Parmentier and the Underhills.

After their father's death in April, 1829, that part of Croton which had belonged to him became vested in his two sons, Dr. Richard T. and William A., who bought the land from the other three heirs in the family. Their respective pieces of property on the Point were separated by a line defined in part by a row of pear trees on the east slope and three large chestnut trees on the top of the plateau.

William, the younger son, who thus acquired one hundred and sixty-five acres on the north side of the Point, established a brick manufacturing business about 1830 and prospered in that enterprise. It was an enterprise that has had its counterparts elsewhere in the environs, even down to recent times in the well-known brick yards of Haverstraw across the river, and was based on the glacial clays deposited on the Croton Point moraine. About the same time that he began manufacturing brick, William set out vineyards. At first, foreign varieties were planted; improved native varieties were not yet available. The former did not succeed, and after a few years were replaced by the variety 'York Madeira' which had originated at York, Pennsylvania. Then, when the 'Catawba' and 'Isabella' grapes were introduced, they were grafted on 'York Madeira' and eventually covered about twenty-five acres of William's property; his net proceeds from the sale of them, from 1860 to 1871, amounted to $33,360. 'Catawba' had originated in Maryland at some time before 1819, a hybrid between *Vitis labrusca,* the native American grape, and *V. vinifera,* the grape of history of the Old World. It was long the standard red grape in the markets of eastern North America, but partial susceptibility of the foliage and fruit to fungi eventually led to its decline. 'Isabella,' a product of the same parents, was obtained about 1816 by William Prince, the prominent nurseryman of Flushing, Long Island, and was one of the mainstays of early viticulture until it, too, was succeeded by better varieties.

It is in Dr. Richard T. Underhill, William's brother, that we finally encounter the principal character in this historical account. He was born in 1802 in the home occupied by the family on the Croton River before they acquired Teller's Point. By the time he became prominent on the Point, he was an orthodox Quaker, bachelor, and retired physician who had discontinued his medical practice in New York City to take up residence on Croton Point.

Soon after his brother William had started grape culture, he followed suit, and eventually had more than fifty of his eighty-five acres under vines, attended by a vinedresser from the Rhineland. He was apparently much more than a physician turned farmer, for before many years had passed, he became President of the Westchester County Agricultural Society, and in *The Transactions of the American Institute of the City of New York* for 1847 are twelve references to him as an agricultural authority. Among the local press notices of the esteem in which he was held was the following editorial in the *Westchester Herald* of Sing Sing on October 23, 1849:

"In the press of other matters last week, we neglected to acknowledge the receipt of a basket of the most delightful Isabella grapes from the Croton Point vineyard of Dr. R. T. Underhill, the indefatigable president of the County Agricultural Society. This favor is annually extended to us and is highly appreciated by us. Indeed, we feel it is a pleasure as well as a duty to commend the example of this enthusiastic cultivator of the soil who devotes a considerable portion of his time and fortune to the improvements of the products of agriculture. His variety of native grapes at the late fair attracted much attention. We hesitate not to say, according to our humble judgment in such matters, that his entire premises at Croton Point form altogether a model farm. We therefore recommend his system, as well as his enterprising public spirit, to the imitation of our farmers in all portions of the County."

Two years later the American Institute's medal was inscribed: Awarded to R. T. Underhill for the best display of native grapes, 1851.

Richard's grapes were sold mostly as fresh fruit in New York City, and the opening of the New York Central Railroad in 1849 must have been a tremendous boon to his trade. Before that year, the produce of his vineyards had to be hauled by wagon; possibly boats served at times. Much of the crop was converted into communion wine at Croton Point and then conveyed to the metropolis. For storage he constructed subterranean wine cellars in the side of the plateau on the Point, cellars which have been somewhat reconstructed in recent years and are now used by the County Recreation Commission for harboring camp equipment. In the files of the Westchester County Historical Society is an original copy of the 12-page, 4- x 7-inch brochure which he issued in 1866, a pamphlet entitled *Croton Point Wines — The Pure Product of the Grape, Neither Drugged, Liquored, or Watered,* which informs us that he had a depot at No. 7 Clinton Hall, corner of 8th Street, between Broadway and 4th Avenue, New York, for marketing the produce from his fifty acres.

This pamphlet informed the public that:

"The vineyards from which these wines are produced are over fifty acres in extent and are located about thirty miles above New York City upon Croton Point, a peninsula nearly surrounded by the water of the Hudson River, with the broad bay of Haverstraw above, the Croton on the East, and the Tappan Zee below, rendering the locality one peculiarly adapted to growing the grape in its highest perfection. The Point where the vineyards are located is about sixty feet above the water, with a soil some twenty-two feet in depth and entirely of a mineral formation, being composed of granite, gneiss, hornblend, ising-glass and silex, with a small mixture of oyster shells, being the disintegrated rock washed down and deposited by the Great Northern Drift. The vineyards show a gentle easterly and westerly slope, with a belt of woods running around the westerly sides sheltering the vines from storms and cold winds, and allowing the fruit to fill out and ripen to its greatest perfection and sweetness."

"The vineyards consist principally of Isabella, Catawba, Hartford Prolific, Oporto, Norton's Virginia Seedling and Clinton Grapes, with a number of other varieties on trial and undergoing experiment."

"To bring the grapes used for wine to the highest perfection, from three-quarters to four-fifths of those which form on the vines are destroyed in June, and those which remain are allowed to get exceedingly ripe and sweet; they are then picked and assorted with the utmost care that no unripe or imperfect berries or foreign substance gets into the wine press. After the wine is drawn off into casks it is stored in capacious underground cellars which are kept cool and freely ventilated, there to gather age and body."

The pamphlet then briefly describes the five wines that were produced on Croton Point and gives testimonials selected from ten New York newspapers and other periodicals from 1859 to 1866. That was in the days when tonic and therapeutic qualities were attributed to wines, and when physicians gave their approval to certain brands. Nine such medical testimonials are also included in the brochure. One doctor, signing as a specialist in spinal affections, reported that he had been using Dr. Underhill's wines extensively for six years in his practice, and was so well satisfied with the results that he prescribed no other wines. And Dr. William Parker, Professor of Surgery in the College of Physicians and Surgeons, testified that:

"At this time, when wine and spirits are generally vile compounds, whose use is destructive to life and health, Dr. Underhill, or any other one furnishing wines upon which we can rely, confers an incalculably great favor upon the public."

It was in this high esteem that Dr. Richard lived and served his imbibing public until his death in February, 1871. Next year his real estate on the Point was sold at public auction to his brother William. Some thirty thousand gallons of wine and two thousand gallons of vinegar were stored at the time in his underground vaults, and receipts for the sale of this accumulation at 139 East 8th Street, New York, bore not only the usual "His wines are never drugged, liquored nor watered," but also the request that "customers will please return Baskets and Boxes as soon as possible."

William died two years after acquiring Robert's holdings, and twenty-two years later, in 1895, the next Underhill heirs sold all their property on Croton Point. After that, for a quarter-century, it was anybody's stepchild, as one writer has aptly described the situation, until 1924 when Westchester County acquired possession of the land for recreational purposes.

In summarizing the achievements of this family in his monumental *The Grapes of New York,* published in 1908, Dr. U. P. Hedrick stated that:

"No one family has furnished so many members who have been prominent in American grape-growing as the Underhills . . . The first three Underhills were pioneer vineyardists in this State, and were men of great enterprise and initiative, contributing much to American viticulture by precept and example."

Along with this eulogy, however, Dr. Hedrick remarked that none of the first three Underhills on the Point—Robert, Richard and William—was an originator of any new variety of grapes, and that it remained for Stephen W. Underhill, born at Croton Point in 1837, the son of William, to do what his forebears did not, although apparently without noteworthy success. Of him we read that

"In his boyhood he became familiar with the grape-growing operations of his father and uncle, and about 1860 became interested in hybridizing as a means of originating new varieties. Most of his work was done between 1860 and 1870. He originated Black Defiance, Black Eagle, Croton, Irving, Senasqua and many other named and unnamed sorts. Of his varieties it may be said that they generally show too many Vinifera weaknesses for profitable commercial sort."

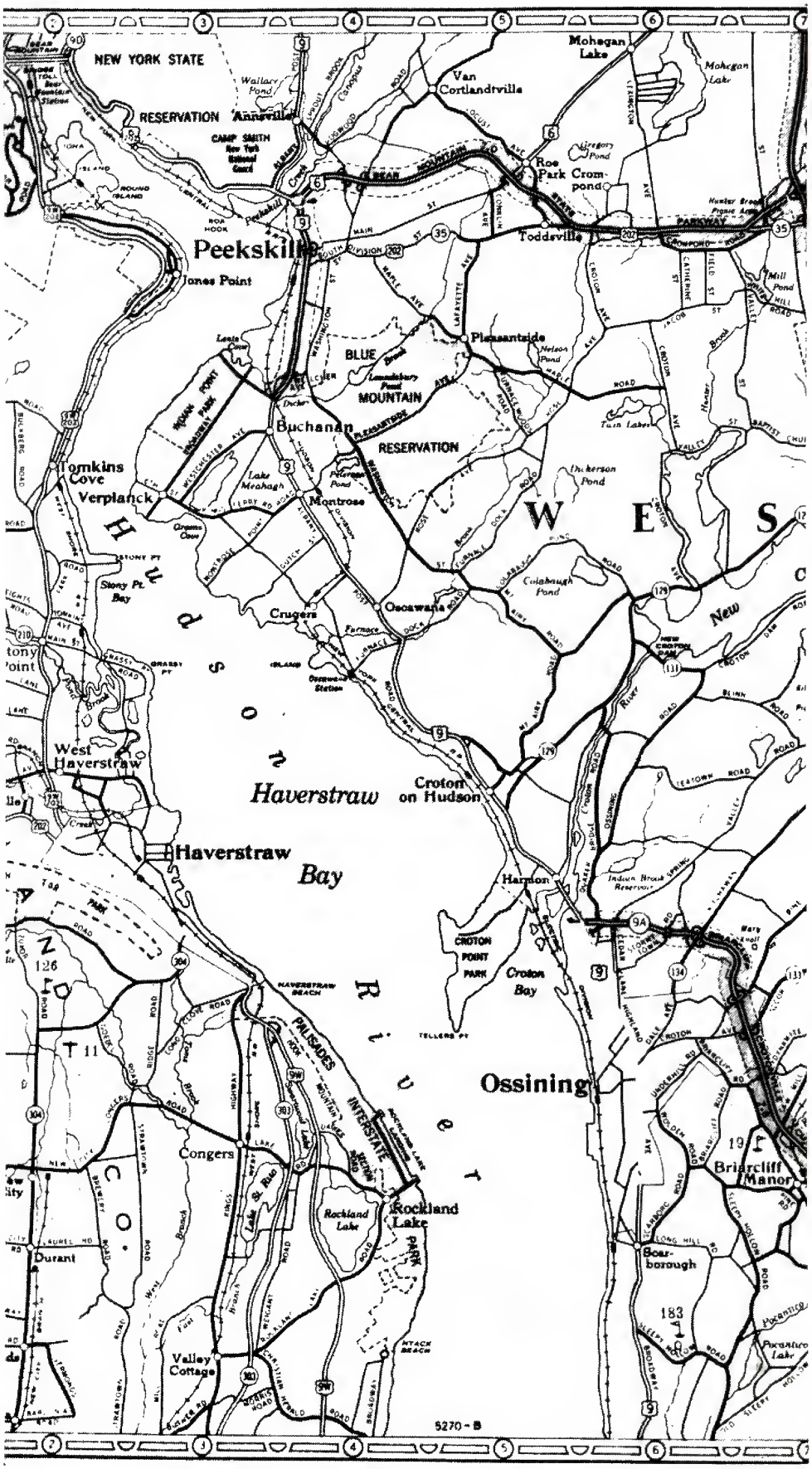
Stephen thus pursued a phase of viticulture in which his father and uncle were not interested, but, unlike his uncle, he appears not to have commercialized his grape-growing, for after his father's

death in 1873 he devoted himself almost exclusively to continuing the paternal brick manufacture.

Two large houses stood at one time on the Point. The first was the "Homestead," erected on the north side by Robert, either shortly before or immediately after he bought most of the land from the Tellers in 1804 and relinquished his interest in the milling operations on the Croton. Richard and his brother and sisters were raised in that home, and it later became the residence of William when he was engaged in brick manufacture and preceded his brother in raising grapes. In an unpublished but formally written historical account left by one of his descendants, we are told that Robert's purchase from the Teller heirs did not include the twelve acres at the outer extremity of the Point, but that Richard later acquired them—we are not told from whom—and that he erected a home on them. Elsewhere, among notes on file in the County Historical Society Library, is a statement to the effect that in March, 1835, that is, six years after Robert died, the "heirs of Robert conveyed to R.T.U. of New York City part of the farm called 'Teller's Point'." It was much too academic a question, with little bearing on the principal concern of this article, for me to determine precisely who acquired those twelve acres from the Teller heirs. The important event is that in 1846 Richard erected a so-called Italian villa, known as "Interwasser," on the highest spot of the peninsula and that:

"Ashlar marble quarried at Sing Sing and cut by prison labor formed the basement while the upper portion was stuccoed brick. Over the front door was a tower room enjoying extensive views up and down the river. It was another large and commodious house given to hospitality and one of the show places in the county. Visitors from far and near were attracted to the Point houses, as traditions and letters bear ample testimony. Among the many assets of the place were shad fishing and crabbing, duck shooting and hunting, boating and skating, together with the wonderful gardens and orchards and all permeated with the most cordial atmosphere."

The present-day driveway, noted at the beginning of this article, circumscribed the villa, and undoubtedly it was Dr. Richard, the retired, grape-raising, wine-producing, Quaker, bachelor physician who planted the yew trees of this account, for their estimated age of one hundred and ten years indicates that they started life a few years after "Interwasser" was erected. No reference to them was found in any published historical account or in any family notes or letters which I examined. Speculation and investigation regarding their possible source reveal that any one of several nurseries, surprisingly well stocked with fruit and ornamental woody plants in the middle of the nineteenth century, might have furnished



them. Perhaps the most likely source, and worthy of mention here if for no other reason than its historical importance, was the Linnaean Botanic Garden, known also as Prince's Nursery, at Flushing, Long Island. It was the earliest nursery of importance in the United States, founded in 1730 by Robert Prince and continued by three subsequent generations of that family. English yews were offered for sale in a catalogue issued by his son William in 1820; a one-hundred-and-forty-year old original copy of which today reposes, among other items of similar nature, in the Library of The New York Botanical Garden. It is more than a catalogue, for it bears the title: A Treatise on Fruit & Ornamental Plants, Cultivated at the Linnean Botanic Garden, Flushing, Long Island, near New York, William Prince, Proprietor.

A little more than twenty years later, this famous institution was in the hands of Winter & Co. In two ninety-two-page catalogues issued by that concern in 1843-1844 and 1844-1845, and also now at The New York Botanical Garden, *Taxus baccata* trees were offered for sale at thirty-seven and a half cents. Among hundreds of other kinds of woody and herbaceous plants listed in these two catalogues are the native American yew *(Taxus canadensis)* for twenty-five cents and the Irish yew *(T. hibernica)* for fifty cents.

Regardless of where Dr. Underhill obtained his seedling yews, the four trees that have matured from them constitute the most conspicuous evidence today of horticultural interest on the part of three generations in one family through three-quarters of a century on Croton Point. It is interesting to speculate, as one admires the trees today, that their parents may have been consumed as yule logs and cheered a hovel or a royal court at some Christmastide in the England of George III.

Fifty years before Richard's death, the nearby Sleepy Hollow country around Tarrytown was immortalized by Washington Irving in his tale of Ichabod Crane and the headless horseman in his famous Sketch Book. Croton Point also has had its specter, less renowned, to be sure, but still vivid in the mind of one of the last survivors of the Croton Point Underhills; she told, only a few years ago, of Cato, Richard's horse, still pulling the doctor's carriage around the ruins of "Interwasser." Cato, it appears, never had to be steered, and the nocturnal creaking wheels behind him could be heard on the Point many years after he, Richard, and "Interwasser" were memories.

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THE COMMON HORSETAIL

By Joseph Monachino

Mr. Monachino is Associate Custodian of the Herbarium of The New York Botanical Garden.

NEITHER STURTEVANT in *Notes on Edible Plants* (1919) nor Fernald and Kinsey in *Edible Wild Plants of Eastern North America* (1943) report the common horsetail *(Equisetum arvense)* as fit to be eaten. On the contrary, it is known to be poisonous to horses. Therefore the following story is worth relating, for it indicates that the fertile stems of *E. arvense* are indeed edible.

In the afternoon of April 23, 1960, I saw a young Japanese and his wife collecting the fertile stems of *Equisetum arvense* along the aqueduct trail in the area of Van Cortlandt Park, Bronx, New York City. They had gathered a very large quantity of these sporiferous stalks which at that time were plenteous. Then the young man settled himself comfortably in a delightful spot near a trickling rill and sketched the plant, with truly subtle artistry, in a natural setting. His lithe wife continued gathering nearby; her hand now and then was lightly dusted with the pale greenish puffs of spores emitted from the cones of the stalks as she plucked them. The artist-harvester's responses to my inquiries were affable and explicit. The plant was being collected, he assured me, not for art alone, but "for food, good food." He was interested in its name which he wrote down as I spelled it. "Eaten in Japan. Also sold in Chinese food stores," he told me. "Needs no special preparation. Remove the black sheaths, for they are tough." He demonstrated this as he spoke. "Simply cook with pork or cabbage." I did not urge him to elaborate on the information he volunteered.

I pointed to the green sterile stems —and he knew that they belonged to the same plant. "Not edible," he said. I drew the fan-shaped leaf of ginkgo on a piece of paper. He recognized it instantly, pronouncing its name in Japanese, and accurately described the plum-like fruit, its stone and edible kernel. Obviously, the man was informed in these matters.

More extended, but by no means exhaustive search into literature disclosed only one reference to the common horsetail as edible. Natalia Ossadcha-Janata in "Herbs Used in Ukrainian Folk Medicine," (1952) stated that the roots of *E. arvense* are rich in starch and the fertile stem in sugar, and that the herb is edible. Sturtevant briefly noted two other species, both with fruit-bearing habit different from that of the precocious common horsetail. He cited old references to the rhizome-tubers of *E. fluvitale* as food and to the "young heads" used like asparagus; and to the evergreen *E. hyemale,* as food in time of famine. Fernald and Kinsey take up these citations, but warn that the group develops a powerful nerve-poison: "Since the horsetails contain aconitic acid and are known to poison animals it is very unwise, if one could possibly be tempted to do so, to eat the new sprouts." R. W. Pohl ("Toxicity of Ferns and Equisetum" in *American Fern Journal* 45:95-97. 1955) explains that the deleterious principle of *E. arvense* is not a true poison but the enzyme thiaminase which destroys vitamine B_1, thiamin, in the gastrointestinal tract of the horse. The common horsetail, as "Herba Equisetii," has been long employed as a diuretic. Ossadcha-Janata notes also its styptic action and adds a host of ill-sorted reputed values including its use, because of the silica content, for cleaning rifles

(Continued on page 151)

Quaker Hill Museum of Natural History

By **Olive M. Gunnison**

Olive M. (Mrs. Raymond M.) Gunnison has been a member of the Corporation of The New York Botanical Garden and of the Advisory Council since 1950.

Some of the exhibits on display in the Quaker Hill Museum.

AT THE END OF MY GARDEN in Pawling, Dutchess County, New York, is a building which houses a collection representing every branch of natural history. There are even meteorites here. Everything in the Quaker Hill Museum is a product of Nature, and so I chose the motto "What Hath God Wrought" to put on one of the overhead beams. This, as you may recall, was the first message sent in code over the telegraph, in 1844, by Samuel Morse, who gave God credit for his invention.

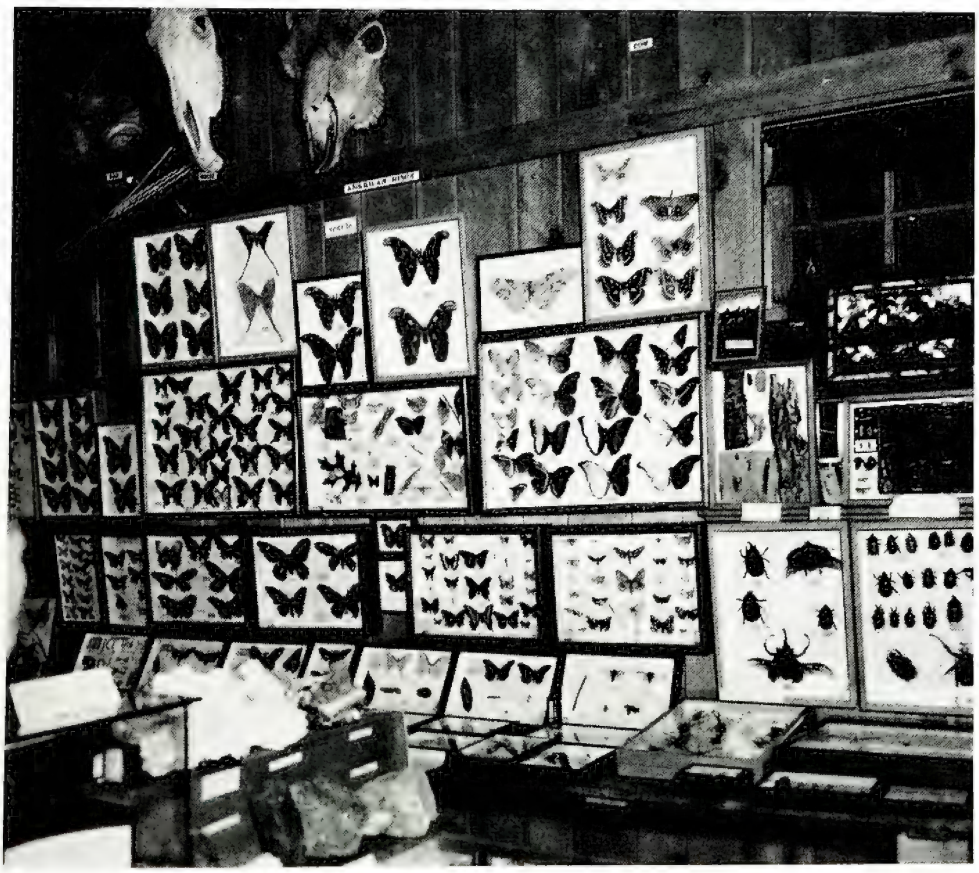
Over fifteen thousand visitors have read the motto since the Museum was opened in 1942. The doors are open day and night nine months in the year, and there is no admission charge.

Obviously I cannot spend time with every visitor, but I do try to be there when groups of school children arrive. Older people who can read do not need me. I pride myself on the labeling of the exhibits, for every label gives as much information as possible. A mineral marked "bauxite" means little to the average person, unless he reads that it is the principal ore of aluminum.

Gathering this collection through the years has given me immeasurable pleasure. I should like to share some of this pleasure with the readers of *The Garden Journal* by telling them briefly what I consider are the highlights of each branch of natural history in the Quaker Hill Museum.

Because of the interest in nuclear weapons, no mineral exhibit would be complete without specimens of uranium ore, also called pitchblende, which is the "spark plug" of the atomic bomb. Here are ores from different localities and a piece of fused silica from the first atomic bomb explosion in New Mexico. The most spectacular mineral in the collection is a ten-pound piece of optical-quality quartz, mounted on a black box which contains two revolving disks of colored lights. As these illuminate the quartz, one or more colors may show at a time, for the fractures in the quartz break up what otherwise would be straight beams. The colors change constantly. This is quite different from what goes on in the fluorescent cabinet, where dull minerals are suddenly changed to brilliant colors by long- and short-wave lamps.

Among the fossils, tracks of dinosaurs on a large stone slab attract much attention, as do the skull of a prehistoric horse or *Mesohippus,* and the tooth of a mastodon and of a mammoth. Finding these in the most remote antique shops has been a thrilling experience. All have been authenticated by experts. Amber is a fossil resin from coniferous trees, in which insects and small lizards sometimes became imbed-



Mounted specimens of butterflies and moths in the Quaker Hill Museum.

ded before it hardened. Specimens of amber with such creatures imbedded have been given to me by visitors to the Museum.

Collecting shells has always been a popular hobby, for many beautiful ones can be found on beaches all over the world. The carving of shells is an art that dates back many hundreds of years. Everyone is familiar with the cameo; here, beside a carved shell left intact, is a cameo pin, a family heirloom. The large white or less common black shells of the pearl oyster were often carved with Biblical subjects, and the workmanship may be exquisite. Two of these carved shells in my collection represent "The Last Supper" and "The Holy Family." This is not the pearl oyster used for cultured pearls: they come from a smaller species. Among land snails is one that lays an egg, shown here, that resembles the egg of a pigeon.

Birds and their nests and their eggs compose one of the large groups in the Museum. I shall mention only two extant species. The kiwi (kee-wee is the sound it makes), a large bird without wings or tail feathers, is the national emblem of New Zealand and is now protected by law. It is nocturnal in habit, can run very fast, and lays an egg equal to one fourth its own size. The black "superb bird of Paradise" appears to have three sets of wings. One pair, soft and downy, comes from the sides of the body; another pair, an iridescent green, from the breast; and the third pair, the real wings, are in the normal place. The passenger pigeon and the heath hen are among the extinct birds represented in the collection. The largest nest in the collection is that of the crested cacique, a tropical American oriole from Tobago where this bird lives in colonies. The nest is about three feet long, with an opening near the top of its long neck—one wonders how the young birds ever get out. The birds' eggs shown range in size from those of the hummingbird to the model of a moa egg. The moa, an ostrich-like bird twelve feet tall, is now extinct.

Butterflies, especially the beautiful morphos from South America, always attract attention. Here is a small moth known as death's head, because of the perfect image of a skull on its thorax. It utters an audible sound which the peasants of Europe consider a bad omen.

The reptile exhibits are intended to educate visitors to recognize the distinguishing characteristics between the poisonous and the very useful and harmless snakes. Sections of skulls reveal the differences between fangs and ordinary teeth and why fangs cannot be removed permanently. One exhibit shows a timber rattlesnake in its natural habitat. Suddenly the snake turns into a skeleton. This has been accomplished by equipping the show case with tricky lighting, a chrome mirror, and a timer. The skeleton, of course, was taken from this particular snake and laid in the same position.

The invertebrates, most of which are in preservatives, are of interest chiefly to biology students who visit the Museum. I have made no mention of coral, starfish (which is not a fish), and so on, but many species are to be seen in the Quaker Hill Museum. Because the bones on the under side of the skull of the gaff-topsail fish form a natural crucifix, complete with halo, it is called the "crucifix fish." The reverse side shows a priest-like figure, wearing a robe, and with arms extended.

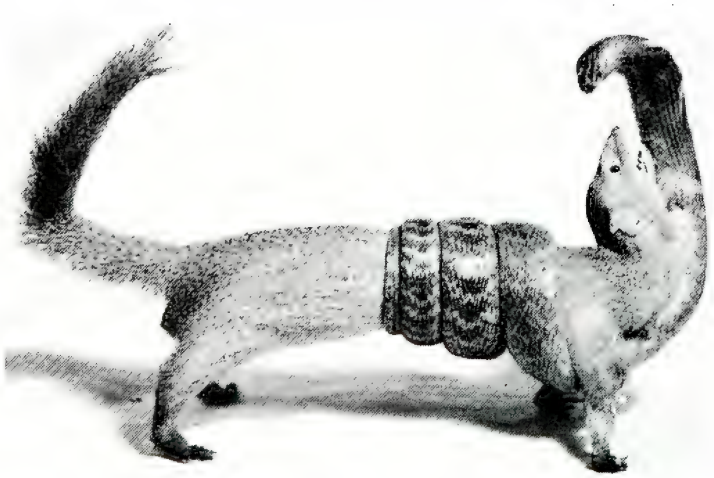
Because space is limited, most of the mammals are small in size. The most interesting is a mongoose with a cobra wrapped around its middle; the two are staring at one another. This, of course, never happened in Nature; it is the product of an imaginative taxidermist. Incidentally, the cobra is slow in striking, so the mongoose usually wins the battle.

Many interesting artifacts, American and Alaskan relics, and a Jivaro shrunken head are included in my collection.

Although many of the visitors are not especially interested in botany, they do find the models of fungi in a large lighted case fascinating. Here are sixteen groups of common edible and poisonous mushrooms, in natural size and color, and those that are to be avoided are plainly marked with a skull. Information is provided about the dangers of unreliable tests on which many people stake their lives. The attractive beans of the castor-oil plant are shown, separately, as they also are poisonous; one bean could be fatal to a small child. The poison is an alkaloid not found in the oil. In a shallow case are parts of plants used in medicines; for example, cascara, quinine, and licorice.

Have you ever seen the fruit of the cannon-ball tree *(Couroupita guianensis)*, the round hard case in which Brazil nuts *(Bertholletia excelsa)* grow, or the largest seed in the world, the fifty-

Mongoose and spectacled cobra—
the product of an imaginative taxidermist.



The kiwi has nostrils at the tip of its flexible bill.
This bird has neither wings nor tail feathers.

Herbarium sheet of ragwort *(Senecio pauperculus).*

pound seed of the double coconut *(Lodoicea maldivica)* which comes from the Seychelles Isles off the coast of Africa? All are here and many other odd seedpods. Pine cones are an interesting group; they are of such different sizes and shapes, especially those from western species. Strange, is it not, that the giant redwood produces a cone only about an inch long? The cones of fir trees shatter when ripe, so they need a hair-net to keep them intact. Some one sent me two pine balls from New Brunswick, Canada; until then I had never seen nor heard of them. They are very solid, almost perfect spheres. One is the size of an orange, the other somewhat larger. As the needles are blown over the ground, they adhere to each other and also pick up light debris; the rolling over and over shapes this material. As the balls move around, they continue to pick up needles which penetrate and then break off, so that the balls appear to be made entirely of pine needles.

Labels on whole nuts, beans, and oil of the tung-oil-tree, *Aleurites fordii,* tell of the value of this oil in lacquer. Until this tree was grown in the Gulf States, the oil was imported from China. Labels on the cocoa pods state that they grow on the trunks and older branches of *Theobroma cacao* in Trinidad. One pod, cut lengthwise, shows the beans which contain theobromine, an alkaloid which is responsible for the stimulating properties of chocolate. Here is a label explaining that peanuts do not grow on the roots of *Arachis hypogaea,* but on the long stalk of the pod which is forced underground where the ovary ripens. Other labels explain, with specimens, that acetate and viscose rayon fibers are made from wood chips and cotton linters; that broomcorn, *Sorgum vulgare* var. *technicum,* was first grown in the United States by Benjamin Franklin from a seed he found on a broom; and that the familiar Spanish moss, which drapes trees in the South, is not a moss, but a flowering plant of the pineapple or bromelia family.

Few people have heard of "jarina" or vegetable ivory, *Phytelephas macrocarpa,* from tropical America, whose large nuts are made into buttons and sometimes carved, or know that brown or "Nankeen" cotton is the cotton that slaves had to grow for their own use.

All the common grains are represented in Quaker Hill Museum by clean seeds kept in bottles. Corn is the most important grain crop in America, but the plant has become so highly civilized, so refined, that it cannot produce a quality crop without man's aid. All kinds and colors of corn are displayed, including the one that has every kernel covered with a husk; pod corn, that is called; and it is probably the nearest to the wild ancestor of all corn. Corn smut (a fungus), a broad, flat ear showing fasciation, and corn products complete this exhibit.

That large chunk of glassy-looking, black material is gum guaiac, obtained from lignum-vitae *(Guaiacum officinale* and *G. sanchen)* from the West Indies. It is used for stabilizing shortenings so that they will keep without being refrigerated. It is added to oils to prevent them from turning rancid, so you eat gum guaiac in cookies and potato chips—and like it!

To me the most important part of the botanical section is the herbarium, which I started just twenty-five years ago. It now numbers about four thousand specimens of ferns and grasses and other flowering plants from many parts of the world. Unfortunately, because of the space required, the herbarium cannot be exhibited with other botanical specimens. Also, because of its fragile nature, the metal cases in which it is stored cannot be left unlocked; inexperienced hands might remove the folders and perhaps damage the specimens. I exchange duplicates with a biology teacher in Texas, and it is a great day in my life when I receive a box from that state.

Many people, even nature lovers, do not become enthusiastic over herbarium specimens. Yet when I am working on my pet hobby, I am constantly reminded of what Robert E. Woodson, Jr., then retiring president of the American Society of Plant Taxonomists, said in his address which was published in *Torreya* in 1954: "Even herbarium specimens, some of them, make one catch his breath for their beauty. Because, as one of my graduate students once told me in a brief moment of revelation, when you know them well, they aren't flat any more." I shall leave my readers with this thought.

A Country Housewife's Garden

By

Gertrude B. Foster

A HOT DRY DAY in July or August is a good time to see an herb garden at its best. It would be nice if visitors were to arrive right after I had spent several days weeding the beds, raking the paths, and trimming the grass around the edges of the garden. Then artemisia 'Silver Mound' would be glistening in the sun, contrasting brightly with the mahogany-colored leaves of purple basil and perilla which stand erect to receive the warmth they crave from the sun. Such a combination of happy circumstances rarely happens. When an editor of *Holiday Magazine* made an appointment to see the garden earlier in the

summer, I felt quite sure I had set aside a propitious time. But the chosen week was one of cold rain. My son Christopher had not been able to mow the lawns, because the grass did not get a chance to dry out between showers. The creeping thyme was spread with wet cobwebs which browned the leaves, the lavender plants looked green and black-stemmed instead of delightfully gray-leaved and purple-blossomed.

The persistent rain was chilly enough to give us good excuse not to linger in the soggy garden. As we entered the house, I gave the bowl of potpourri in the hall a stir to release the scent of mingled herb odors sadly lacking in the wet garden, put the coffee pot on the stove, and then showed him pictures of how lovely herbs can look in the sun.

It is curious that gardeners, who are not vain about other things, really suffer when they cannot show their gardens at their best. They are rather like parents whose offspring represent a joyous creation which no one else can know, who try to reveal the wit or wisdom which the children have exhibited in the bosom of the family, when they are unresponsive in the presence of others. I'm sure you've had a gardener tell you how lovely the iris was last week or how wonderful the delphiniums will be in about ten days.

Ruth Gannett who has a rock garden of several acres on neighboring Cream Hill is accustomed to scores of visitors at all seasons of the year. Her husband Lewis, former book critic for *The New York Herald Tribune,* seems to attract people as flowers bring bees, because he is such a raconteur and hospitable host. Ruth often says of the writers, readers, and local people whom Lewis brings to the house, "I don't care how many people come as long as I don't know they are coming." Any one without a retinue of servants will understand this, for though the Gannett's keep a well-stocked larder and a huge freezer which contains produce grown in their own vegetable garden, any impending entertaining means quite a bit of preparation. In the spring, their casual visitors are usually gardeners with whom they very often share plants or would-be gardeners who have been sent there for inspiration. The story of their weekend garden, which gradually became a panoramic painting on a hillside, has been delightfully told by Lewis in his book *Cream Hill,* which Ruth illustrated with exquisite lithographs.

This spring, the Gannetts agreed to have their garden put on the agenda of The American Rock Garden Society meeting being held in this area. Ruth felt that everything had been done, which time permitted, in weeding and replacing plants in the few bare spots that still remained from the previous devastating winter when thousands of primrose plants had been lost. But she had forgotten about Joe, who had decided that the stone wall at the top of the garden must be rebuilt this year. Joe is a general handyman of parts in West Cornwall. Lewis characterized him as "guide, philosopher, and friend" in *Cream Hill* and described the many ways in which Joe had helped to make the old farmhouse the charming, comfortable dwelling it is today.

Two days before the American Rock Garden Society was due, Joe drove up in a truck and backed across the lawn in front of the house to drop a load of sand at the top of the wall. He and his helper hopped out of the truck and began pulling the rocks down on top of the sand so that they could be reset. A few errands in the village kept him from making much progress that day but as he left he remarked, "Tomorrow is my birthday. Don't guess I'll work tomorrow. Be back on Saturday to reset your wall."

Instead of protesting that the members of the American Rock Garden Society would be stumbling over the rocks Joe had added to the garden, Lewis simply told him to invite as many people as he liked for dinner Friday night at the Gannetts, for Ruth was going to cook him a Mexican birthday dinner. Such are the friends that are made among neighbors in the country. When Joe and his wife were married, the Gannetts turned over their New York apartment to them for a honeymoon.

My brother-in-law Lincoln Foster was host to the American Rock Garden Society at his beautiful and extensive rock garden that is planted over and around a mountain stream. More than seventy people in forty cars arrived after a luncheon-meeting at an inn and spread out over the narrow paths that wind through a scree. Linc developed the scree for growing the most miniature alpine plants. My son, who had been there to park the cars, remarked later that he saw some new species blooming in the garden, "high-heeled lady's slippers" in tight skirts and "interrupted financiers" in berets. One man was dodging among the groups which became somewhat entangled about particularly rare plants. It seemed as though he were trying hopefully to accomplish the feat of taking a picture of the garden where it was not covered with people. Actually, he was trying to take candid shots of certain people, whom he admired, without their knowing it.

It must be disheartening to a gardener who has spent a lifetime of work in making a whole hillside a veritable spring garden to listen to the comments of some visitors when they descend upon it. So often the remarks are about the weather or something grown at home rather than about the garden before them. One grand old lady, who grows thousands of primroses, suffered two garden clubs to view them at their peak this spring. She stood like a female St. Fiacre with a hoe in hand at the top of the garden, brushed aside all expressions of awed delight which the garden was surely due, and admonished the visitors, "Don't be lazy now. Go to the bottom and walk up so you'll see the whole picture."

THE TREE PEONY

By Marinus Vander Pol

Mr. Vander Pol is a landscape architect and nurseryman of Fairhaven, Massachusetts. He specializes in the tree peony and has exhibited fine specimens at flower shows in Boston. Within recent years Mr. Vander Pol has visited sixty or more tree peony nurseries in Japan and also the temple gardens of Buddhist monks in that country.

MANY HOME OWNERS hesitate to plant the tree peony as they are under the impression that it is not hardy. However, it has been growing in some northern gardens for a number of years without winter-kill. In fact, it needs winter temperatures for a rest period.

This much-branched ornamental shrub, which usually flowers from early May till well into June, appears under

(Continued on page 150)

SOME DWARF RHODODENDRONS

By G. G. Nearing

Mr. Nearing has spent many years in hybridizing rhododendrons and has developed some fine hardy forms. For his work, the American Rhododendron Society conferred its gold medal on him in 1957.

TO THE AVERAGE PERSON, the name *Rhododendron* brings to mind the great bushes, sometimes almost trees, of our native *Rhododendron maximum,* with leaves eight to twelve inches long; or the garden hybrids derived from *R. catawbiense,* with growth-habit and foliage only slightly smaller. The more experienced will think also of the Carolina rhododendron, *R. carolinianum,* whose leaves barely measure three and a half inches, while the total height of the plant may reach six or seven feet.

Botanists and garden specialists know that the genus *Rhododendron* includes a bewildering array of more than half a thousand species scattered about the world, which range in height from a couple of inches to nearly a hundred feet, and in length of leaf from half an inch to almost a yard. Comparatively few are hardy in the vicinity of New York, but these few include some dwarfs of rock garden size which should be better known, and others moderately small to suit many situations in foundation plantings. Then too, plant breeders are developing hardier strains of the less hardy sorts, and are hybridizing these to produce wholly new and often highly ornamental hybrids. Hardly a year goes by without some unexpected dwarfs being offered to a surprised gardening public, and some of these novelties are hardy.

Outstanding among the low-growing species is *R. racemosum* from the mountains of western China. Chances are, if one procures seeds of this gem from western or foreign sources, he will grow plants which are neither dwarf nor hardy, for *R. racemosum* is very widespread in its native land and exceedingly variable. But the explorer George Forrest sent back seeds (under Number 16404) from which fully hardy plants were grown, barely a foot high in ten years, and with leaves about the size and shape of one's fingernail. J. F. Rock's Number 59717 is also fairly hardy, but grows slightly larger. By selecting the hardiest plants in each generation, and using seeds only from these, I have built up a hardy dwarf strain, well adapted to the New York area. Most of the racemosums now growing in this region are derived from it. The flowers, clustered near the ends of the branches and produced in great abundance about the first week in May, are of a pure pink without a trace of purple. The color varies from nearly white to deep rose, but is always clean.

Like all rhododendrons, *R. racemosum* requires a permanent mulch that is never disturbed; but because of the plant's low growth, the mulch cannot be very deep. An inch or so of pine needles is about right. Some shade is desirable; certain individuals, however, will endure nearly full sun and so situated will bloom most profusely. Chemical fertilizers should never be applied to any rhododendron.

Rhododendron pubescens is somewhat similar, but taller, and with vigorous vertical shoots. Its leaves are densely hairy (those of *R. racemosum* are smooth), but the numerous small flowers are of like size, about an inch long, and similar in color, though paler. *R. pubescens* is not as hardy as *R. racemosum,* but is now in process of improvement by selection. Individual plants capable of enduring the severe climate hereabouts are already established and will be used as seed parents of a hardier race.

'Windbeam' is a fine hybrid, dwarf and dense in growth and generous in flower production.

A closely related species, *R. hemitrichotum,* with leaves not at all hairy, but clothed with a mealy down, is even less hardy. Patient selection, however, may eventually develop a more enduring strain.

Rhododendron keiskei blooms earlier, usually the last week in April. Its lemon-yellow flowers, an inch or more in diameter, are borne in clusters of from three to six flowers. The thin, somewhat downy leaves may be as much as two inches long, rather narrow and sharply pointed. They look delicate, but are fully evergreen, provided moderate shade and a generous mulch are given. *R. keiskei* resents full exposure to sun and wind. Some individual plants of this species reach a height of three feet or more in twenty years, while others remain almost prostrate.

Rhododendron keiskei deserves and is receiving wide popularity, for it is almost the only yellow species hardy in

Rhododendron racemosum is a low-growing species from the mountains of western China.

Above. 'Wyanokie' is another good hybrid rhododendron which is hardy in the New York area. Left. The leaves of yellow-flowered *Rhododendron keiskei* may appear delicate, but they are evergreen and retained even in low temperatures.

the New York area. There are, of course, yellow azaleas, but these lose their leaves in winter, while the leaves of *R. keiskei* are well retained even in a temperature of nearly 20°F below zero.

Another group of dwarfs centers around *R. lapponicum*. This species, though widespread in the Arctic, and occurring south at high altitudes as far as the summit of Mt. Washington, cannot endure either our hot summers or the often snowless, cold periods of our winters.

Of fifty or more species in the same series, *R. impeditum* and *R. fastigiatum* from the high mountains of western China can occasionally be grown in our climate, but they are evergray rather than evergreen, and completely unattractive in winter. The flowers are purple, approaching a deep blue in the two species mentioned. Others with yellow flowers, such as *R. primulinum* and *R. flavidum,* are less hardy.

In the Lapponicum Series are many species under two feet which appear attractive in printed descriptions, but they are not good garden plants. In the dead of winter their leaves curl against the stem so abjectly that the plants are often supposed to have perished, and so are thrown away still alive. Even in their best summer greenery, they are seldom first-class ornamentals.

Rhododendron ferrugineum, the alpine rose of Europe, is a moderately low-growing, evergreen shrub with bright purple flowers. Generally it is not hardy, but one plant that survives and winters well with me may eventually lead the way to a hardy race of this interesting and historic species.

Hybridists even a century ago did not entirely neglect these promising species. *R. ferrugineum* crossed with *R. carolinianum* gave *R.* x *laetevirens,* an attractive and hardy-foliage plant also known as *R.* x *wilsonii*. It is dense and low, and has thick, small leaves of attractive texture. The flowers, however, are not abundant, and their purple is not a pleasing shade.

The similar *R. hirsutum* from the Alps, crossed with *R. minus* from the Carolinas, produced *R.* x *myrtifolium* much better in flower, though the purplish pink shade leaves something to be desired. Its foliage however, though smaller and rather less attractive to the eye, draws the rhododendron lace-bug which makes serious inroads on the health and appearance of this otherwise desirable hybrid.

More recently *R. racemosum* has invited similar development. Gable's cross with *R. carolinianum,* the group hybrid Conestoga, though a beautiful shrub, has not proved dependably hardy. In the end, a satisfactory clone of this cross may be found. Meanwhile two seedlings from it have already proved themselves.

'Windbeam' has the hardiness of *R. carolinianum,* but a dwarfer, denser growth with more slender twigs and smaller leaves, and an abundance of flowers produced the first week in May. They surpass those of all other hybrids of its class. The deep green foliage, which is exceptionally attractive in winter, and curls but little, disappears under the mass of flowers. These open apricot, turn white, and then, after three or four days, become a soft, pale pink.

After its first twenty years, the original plant was about six feet high and rather more in spread, well suited to the foundation planting in which it stands on the south shore of Long Island. Propagations from it are thriving in northern New Jersey. Although so generous in flower, few seeds are set, so that the faded blossoms need not be removed to ensure buds for the next season, as is the case with all rhododendrons which seed freely.

'Wyanokie', of similar breeding, is dwarfer and sturdier than 'Windbeam'. Twenty years produced a plant only three feet high, five feet in diameter. The flowers open cream-color, then turn pure white, with sometimes a tinge of pink coming in after they have been open about a week. Although less abundant than those of 'Windbeam', they cover the plant well. Since they do set seed, these should be removed after fading. 'Wyanokie' is probably hardier than 'Windbeam', though both are perfectly satisfactory in the New York area. It will take full sun if necessary.

Breeders have crossed *R. racemosum* with *R. keiskei,* but the progeny is less hardy than either species and often loses all flower buds above the snow line. Eventually a hardier individual may be developed from this cross. In the meantime I have crossed it back with *R. keiskei,* and one result is the hardier

'Mary Fleming', now, after seventeen years, a little over two feet high, spreading and bushy, with tiny, pointed leaves hardly an inch long. The flowers, produced in abundance, are bisque-yellow, with salmon streaks on the outside of the corolla, giving a general effect of very pale salmon, an unusual and desirable shade in rhododendrons. Although the flower buds may not endure as much cold as 'Wyanokie', they open well after an average winter in the New York region—about May Day. The original plant is now growing in Upper Nyack, New York.

Crossing *R. keiskei* with *R. pubescens* resulted in the Guyencourt Hybrids, hardy and reliable if kept fairly well shaded. About four feet high after thirty years, they form a bush much like an azalea, with many long shoots from the root which arch out and later branch densely. Unlike those of any azalea, the leaves are fully evergreen, one to one-and-a-half inches long, narrow, and very hairy. The flowers appear at the end of April, small but well-massed all over the mature plants, and most are of a delicate pink. Two of this color have been selected as the hardiest and most shapely plants; they are 'Chesapeake', dense, rather slow growing, and 'Delaware', more vigorous and larger. 'Hockessin' differs in having a few florets here and there of a pale yellowish tint, contrasting with the pink of the majority, though all soon turn white. 'Montchanin' is pure white from the start. 'Lenape' has somewhat larger, though less plentiful flowers, with a lemon-yellow center, giving a general effect of very pale yellow. 'Brandywine', pale salmon-rose, is perhaps the best color of all the Guyencourts. This hybrid often loses some of its buds when exposed to bright sunlight, and is somewhat more rangy in growth habit.

Crosses of the Lapponicum rhododendrons are difficult, and they usually make unsatisfactory plants, for they lack both outstanding beauty and ordinary hardiness. However, *R. carolinianum* crossed with *R. fastigiatum* gave 'Ramapo', an exceptionally hardy dwarf, reaching about two feet in height in twenty years, and densely bushy. Early in May it is well covered with flowers of a bright rich violet. The first day they open, the flowers look a little too purple, but by the second or third day their color has become more nearly blue. In fact, it is the nearest to blue of any fully hardy rhododendron of this dwarf type.

'Ramapo' propagates easily and is now grown in many nurseries for foundation and rock garden use. It appears to endure fertilizers, which are ruinous to nearly all rhododendrons; however fertilized plants of 'Ramapo' may suffer after a time from die-back in many of their branches. Plants showing this type of injury will usually recover, if given good mulch and respite from fertilizers.

The only other plant of the same cross is 'Purple Gem', very like 'Ramapo'; it is a slightly more vigorous grower, and the flowers are a little less blue. The new growth, however, is yellowish green, while that of 'Ramapo' is very glaucous. The color of the new growth is in fine contrast to that of the older leaves. These, on both 'Ramapo' and 'Purple Gem', turn almost purple in winter and retain that shade until after the new leaves appear in May.

All the rhododendrons mentioned so far belong to the section that has minutely scaly leaves. Tiny, roundish, waxy disks are scattered over the leaf, especially on its under surface, and often also cover the petiole and twig, spreading even to the flower. They can be seen plainly under strong hand-lens. Rhododendrons that have scales will usually not cross with the scaleless species, nor with azaleas that have stiff hairs instead of scales.

There are many other dwarfs of this scaly persuasion, but few can be called hardy. *R. radicans,* a species from western China, is the smallest of them all, with pointed leaves about half an inch long and purple flowers borne somewhat like pansies. I once had a hardy plant of *R. radicans,* but I never saw it in flower because mice were excessively fond of the flower-buds. No other plant of *R. radicans* has ever survived even one winter for me, and that one was destroyed by a flood.

The Guyencourt Hybrids, resulting from a cross between *Rhododendron keiskei* and *R. pubescens,* grow well in the garden of Leonard Buck at Far Hills, New Jersey.

R. saluenense, and its close relatives *R. calostrotum* and *R. keleticum,* are dwarf or semi-dwarf; they are alike in general appearance and flower color and in unwillingness to endure our climate. But another of the same series, *R. riparium,* seems hardier. Seedlings have stood in the open bed and in the rock garden two or three winters; but as they have not offered to flower, it remains to be seen whether they are bud-hardy.

R. trichostomum var. *ledoides* is the only species in the numerous Anthopogon Series that has wintered any buds for me in the open, and most of the plants have proved short-lived. One

that has grown rather thriftily in the rock garden for five years or so has not set buds. The flowers, smaller than those of other rhododendrons, but borne in dense clusters the size of a half-dollar, are a bright pale pink and constructed much like those of the garden verbena (*V. hortensis*). Should a hardy form of this or of any of its near relatives, such as *R. sphaeranthum,* be developed, it might prove decidedly ornamental in the rock garden. The leaves are hardly an inch long and very narrow. Eventually the plant might reach a height of a foot or two, spreading to a width somewhat greater.

R. oreotrephes may grow to a height of three or four feet, but usually remains dwarf for many years. It has roundish little leaves, smooth and very glaucous when young; they turn deep purple in winter. The contrast between the foliage and the lavender flowers is most pleasing. I had never considered it hardy, but seedlings have now wintered well in the open for three or four years. However, the only one that budded failed to carry its buds. Several others have buds this season, and if any of them winter, they may start a selection which should result in a hardy strain after three or four generations. *R. exquisitum* and *R. artosquameum* are similar and apparently about as near-hardy. They, too, have some buds and carry equal hopes.

A tiny, creeping rhododendron with relatively large flowers, *R. pemakoense,* and its relatives *R. pumilum* and *R. uniflorum,* would be wonderful acquisitions for any rock garden if only they were hardy. Ben Lancaster of Washington State beat me to the cross of *R. racemosum* with *R. pemakoense* and named it 'Rose Elf'. A plant that he gave me has barely lived through one winter in the open. Its lavender flowers are larger than the better-colored flowers of *R. racemosum,* but far short of the inch-long bells of its other parent. My own version of this cross may soon flower, and could be hardier.

Rhododendron hanceanum nanum, dwarfest of the yellows, and a fine, free-flowering plant, cannot survive our climate, nor has any comparable hybrid of it appeared, in spite of many attempts.

Of the non-scaly rhododendrons that remain dwarf, the most talked about is *R. repens* (now *R. forrestii* var. *repens*). Its typical form grows flat on the ground, though individual plants may reach a height of several inches, or even a foot or more. The bell-shaped flowers, nestling among the exceptionally dark green foliage, are blood-red, large, and fleshy. Of course it is not hardy, but hybridists have been busy crossing it with everything conceivable in the hope of producing something resembling it in a hardy form. Sooner or later we are fairly sure of getting a plant of the same general nature that will grow for us. It is truly a superb dwarf, though slow to bloom and rather temperamental even where hardy, as are most of its somewhat larger relatives. I once had a hardy plant of *R. sanguineum,* very dwarf, but before it reached flowering size it was destroyed by a flood.

One of the most beautiful of all rhododendrons is *R. williamsianum,* the best forms of which reach only three or four feet in fifty years. Young plants look somewhat like the trailing arbutus, *Epigaea repens.* The flowers, inch-long, drooping bells held just clear of the foliage on individual nodding stalks, are truly enchanting in tints of soft pink to nearly white. The smooth, almost circular leaves, an inch or so in diameter, cover the roundish bush so densely as to suggest those of box. New growth comes out with a striking tint of bronze.

Although *Rhododendron williamsianum* is not quite hardy, except in favored spots on Long Island, and flowers too early to escape frost, this species nevertheless gives hope that among its numerous hybrid offspring some may possess at least a part of its beauty combined with reasonable hardiness. The hardiest so far is 'Bow Bells', considerably larger, but a fine thing, reliable on Long Island and in similar climates. I have a hybrid which has twice wintered buds and produced flowers of considerable beauty, but its foliage is a little thin and somewhat disappointing. I have crossed it with other *williamsianum* hybrids, and am hoping.

Still another outstanding species of low growth is *R. degronianum* (formerly *R. metternichii*), with larger, narrow leaves and pink flowers in small trusses. Individual selections have flowered rather consistently in northern New Jersey, and more attention should be paid to this species with the idea of finding a completely hardy form. Praises have lately been heaped on the rather similar *R. yakushimanum;* but as it comes from the Island of Yakushima in southernmost Japan, it lacks hardiness even in mild climates.

These are only a few of the dwarf rhododendrons with striking elements of beauty which hybridizers are struggling to bring within the limitations of our harsh and violent climate. Each year brings some token of victory, some new approach toward a triumph of the gardener's heart's desire.

'Ramapo', dwarf and very hardy, is desirable in rock gardens and in foundation plantings.

KANGAROO PAWS AND BOTTLE-BRUSHES

By George Spalding

Verticordia grandiflora

Mr. Spalding, who is Superintendent of the Los Angeles State and County Arboretum, Arcadia, California, was formerly a student-gardener at The New York Botanical Garden. The following excerpts are taken from the talk he gave at the Fourteenth American Horticultural Congress.

THE EXPEDITION to Australia was a joint project of Longwood Gardens and the United States Department of Agriculture, the fourth such expedition co-sponsored by Longwood. Dr. W. H. Hodge, who is in charge of education at Longwood, went along on the first part of the trip, and his experience in plant collecting in South Africa and South America proved invaluable. . . .

The southern part of Australia has a climate very similar to that of southern California; hence this particular piece of land is of special interest to us at the Arboretum, and for a number of years we have been growing plants from Australia. . . .

We landed in Sydney on the east coast, went from there to Melbourne and Adelaide, then across to Perth. We made two runs across the country; the first, on which Dr. Hodge accompanied me, was for the purpose of seeing as many plants as possible during the blooming season and selecting the areas to which I would return for the collection of seed. . . .

In the botanic garden at Sydney, I found what I believe to be one of the most nearly perfect trees for street and park planting. This is *Podocarpus andinus*. It is evergreen, very evenly shaped, doesn't require a lot of care, seems to grow in almost any kind of soil, and, as far as could be learned, has no diseases or insects bothering it. . . .

Clivia is used in a very interesting way at the botanic garden — as an underplanting, a groundcover beneath a portion of the palm collection. . . .

One of the most fascinating plants is the waratah, *Telopea speciosissima*, a member of the *Proteaceae*. This is a very difficult subject to grow in this country, but we're hoping that, as a result of what we learned in Australia, we shall have better success with it. The waratah grows naturally in a very low, damp area. I was able to collect quite a little seed, but had to travel some distance off the road to find plants as they have been practically destroyed, near accessible locations, by commercial cutting. . . . *T. speciosissima* is a real beauty and lasts two to three weeks as a cut flower. If only one plant brought back from this expedition becomes a successful commercial item, I shall feel that I have accomplished something— and I think the U.S.D.A. will think so, too.

Another interesting native of New South Wales is the flannel flower, *Actinotus helianthii*. This is well named, for the flowers feel as if they had been cut out of flannel. The plant grows one foot tall. It is not a difficult subject and will, I believe, prove to be one of the very attractive plants which this expedition obtained. . . .

From Sydney, we traveled about two hundred and fifty miles into the Khyber Pass, an area considered quite mountainous in that country, at least five hundred feet high. Along the way were great fields of a species of *Echium*, which also grows in South Australia and in New South Wales. There it runs out more desirable pasture plants and so is called "Paterson's Curse." In South Australia, this echium grows where nothing else will, and stock will eat it; so it is called "Salvation Jane." This echium is extremely beautiful, and although not a native of Australia, it has made itself quite at home. It was interesting to observe how plant immigrants have taken over large areas. . . .

Eucalyptus are very typical of the landscape throughout this part of Australia — in fact, practically the only vegetation, from east to west, is species of *Eucalyptus*. We are growing over three hundred at the Arboretum, but I believe that I found about twenty-five or thirty that are not yet introduced. . .

Back to Sydney, then on to Canberra. Along the road, slightly in from the coast was a large area covered with one of the cycads, a species of *Macrozamia*, as undergrowth in an eucalyptus forest. Knowing how we struggle in the West to grow these cycads, it was exciting to see them growing in such abandon. This macrozamia is a very beautiful plant; when in seed it is bright red and a very spectacular sight.

From Canberra, we traveled to Melbourne and naturally visited the Melbourne Botanic Garden. I have not seen the major botanical gardens of the world, but I have been told, and can believe, that this is one of the greatest. It was started by Baron Von Mueller over one hundred years ago on boggy, unusable ground, rather uninteresting; but through dredging to make lakes and to contour the land, a beautiful garden was developed with many fine plants. There I saw *Melaleuca linariifolia*, one of the items I was after. It bursts in spring into such a profusion of flowers that it looks like a mound of snow. I was informed that *M. linariifolia* should prove hardy and was very lucky to get an adequate quantity of seed. I hope before long that this bottle-brush will be introduced into the trade.

The Australian *Epacris* is related to the heathers and one particularly fine plant was, to my own knowledge, in bloom four months. It was in bloom when I arrived in September, and it was still in bloom when I left in January. I regard it as among the outstanding ornamentals I saw in Australia. As I was told it was very difficult to grow, I took not only seed but cuttings. I hope the U.S.D.A. men at Beltsville have been able to root them.

Another group of Australian ornamentals which should be given atten-

tion in this country is the genus *Boronia.* From time to time in southern California, we find *B. megastigma* in the trade; it is chocolate-brown, brilliant yellow inside, and extremely fragrant. *B. heterophylla* is the only pink which is also fragrant. *B. megastigma,* which is native to Western Australia, is picked freely every spring. One doesn't have to go into the center of Perth to know when it is boronia season; its fragrance pervades the entire city. Spring has come when boronia sellers are around.

One of the so-called mint bushes is *Prostanthera* belonging to the *Labiatae.* Very typical of many of the Australian shrubs, which one passes by a good part of the year without noticing; then suddenly one day he is confronted with a bush so covered with flowers he can hardly see the stems. I was fortunate in being able to get several species of *Prostanthera....*

From Melbourne, we went into the Grampians, which is the summer playground of that part of Australia, and on the way I saw a beautiful specimen of *Eucalyptus melliodora. . . .*

The most outstanding shrub which I saw in the Grampians was *Thryptomene calycina,* a member of the *Myrtaceae.* This is such a wonderful thing in its blooming period that the scavengers come out in trucks and literally tear the shrub up by its roots, or cut it down, to sell as cut flowers. A special corps of forest rangers is on duty to stop the destruction of this plant, which is fast becoming extinct. As a cut flower, *T. calycina* lasts for a month or two, and as such is an extremely valuable item. I was fortunate in getting quite a few species of *Thryptomene,* from little groundcovers to shrubs up to eight feet, and have high hopes that they will be successful introductions. . . .

Erica ormondi, a heather from South Africa, seemed one of the worthwhile plants, even though not a native of Australia. I might state that my concept of plant exploring is to bring back anything useful, even though one is seeking native material; just because a plant happens to be an exotic I do not pass it by. . . .

From Melbourne, we went to Adelaide in South Australia. South Australia is one of the poorer states, both in horticultural material and in wealth. It does, however, have very fine vineyards and is famous for its wines. . . .

Mallee eucalyptus are among the most colorful of the genus. They grow twelve to fifteen feet tall, are multistemmed from the base, and have what are called ligno-tubers, that look like huge cankers, at their base. Apparently, these are their means of survival, as the land is periodically burned over. Their flowers are very showy, and in some the foliage is especially attractive. In Western Australia there is a beautiful grey-leaved species, *E. rhodantha.* This has scarlet flowers which are four inches in diameter. . . .

The title, "Kangaroo Paws and Bottle-brushes," really doesn't refer to kangaroos, as you have surmised. However, I saw the finest of kangaroo paws, *Anigozanthos rufa,* in a garden called "The Sanctuary," whose owner was interested in preserving the native flora and had a very extensive collection. *A. rufa* is actually a native of Western Australia but, as happened many times during the trip, some of the finest examples of the flora of one state were cultivated in another state. This particular species comes from Esperance, down in the southeastern corner of Western Australia. This is one of the plants Longwood Gardens in particular should be fairly successful in growing as a pot plant. It is moderate in size—the largest I saw was about two feet tall — and apparently not too difficult to grow. Another species that we have grown at the Arboretum for a number of years is *A. flavida.* It makes a spectacular show for about four months, and for over six months the dried flowers furnish an effective display. . . .

From Adelaide, South Australia, we flew north to Perth. I might add that during the five and one half months I was in Australia, I crossed from east to west four times and covered twenty thousand miles. Approximately half of that mileage was by air, but much of the remaining ten thousand miles was on foot — hot and dusty. However, when one is accomplishing something, the inconveniences — and plant collecting is certainly composed of inconveniences as well as achievements—must be taken in one's stride.

Western Australia I found the most interesting part of the whole trip. In summer, the climate is hot and dry; in winter, wet and cold—comparatively speaking that is, for actually freezing temperatures are not recorded. The flora is completely unique, quite different from that in other parts of Australia and quite different from that in other parts of the world. . . . Western Australia is still much as California was before the subdividers arrived. There are acres and acres of wild flowers in a display which renders one speechless. . . .

In a private garden in Perth, I saw a white form of the Geraldton wax flower, *Chamaelaucium uncinatum.* The more common rose-pink or magenta form has been grown in California for years. It is an extremely fine cut flower, not too difficult to grow. The pure white-flowered form, with center slightly greenish, would make a beautiful shrub in anybody's garden. It is also an excellent cut flower. I hope we shall have cutting wood coming in shortly.

Collectively several genera are referred to as bottle-brushes, but most commonly the name is applied to the genus *Callistemon. C. speciosus* has been grown in California for a number of years, and I am sure that it will do well at Longwood Gardens under glass. It is a fairly good cut flower, doesn't hold up as long as some of the other Australian subjects, but as it is so showy, it is well worth having. . . .

In a trip to Carnamah, two hundred and fifty miles north of Perth, where we drove at night, we saw a very interesting wood pear, xylomelum. The fruits look like pears, are white, and stood out so sharply in the car headlights, we wondered what in the world was along the road. . . .

Hibbertia lasiopus is one of the finest creeping plants that I have ever seen. The flowers are two to three inches in diameter, the foliage very thick and leathery, and the ground on which it grows almost solid rock. . . .

Another ornamental that should be useful in southern California as a low edging plant in the foreground of borders and in the East as a pot plant is the sowerbaea. It resembles the "society garlic" *(Tulbaghia violacea),* a South African relative of the garlic without the garlic odor. This is a very lovely thing; we found it in many areas, growing with complete abandon in the most unpropitious locations. . . .

One of the interesting *Proteaceae* shrubs is *Dryandra polycephala,* again

Grevillea synaphae is one of the many plants collected by the author in Australia to be tried outdoors in southern California and indoors at Longwood Gardens before being introduced to American gardeners.

in that group which is difficult, at least for us in southern California. It is a really ornamental plant and one which I should like to see introduced into this country. . . .

Another shrub which is very showy when in flower is *Banksia prionotes*, about eight feet tall, a bit leggy; but even when not in flower, it is interesting because of the foliage. This is a shrub breeders should take in hand — to get the very lovely flowers on a sturdier plant. I believe M. de Vilmorin would be interested in some of the Australian shrubs, as well as the annuals and perennials. *B. prionotes* will last at least a month as a cut flower, and on the shrub the flowers last even longer. . . .

A tiny cats paw, about six to eight inches high, grows in pure white sand which goes down twenty feet and has, as far as we could tell, no organic matter in it. . . . In the tremendous sand plains, as they're called, there is a rich and varied flora. . . .

This cats paw, its yellow form, and another species of *Anigozanthus* were found growing along a railroad embankment. The three stretched roughly for three miles, but we never found two of them growing together. First would be the cats paw, then the yellow form; that would break off, and *A. bicolor* would take over. It was always a pure stand of one kind, never a mixture. Whether this indicates that they would not hybridize, I do not know. *A. bicolor* is quite close to the spectacular red and kelly-green *A. manglesi*, probably the most unique of the genus. ...

Going along the road from Geraldton to Mullewa, we found a beautiful little verticordia. On close examination, it looked like the Geraldton wax flower and is, I believe, a member of the *Myrtaceae*. Its abundance of flowers smother the plant. We have had seed of verticordia in the past and were unable to germinate it. Longwood Gardens discovered, I believe, the answer to that problem when I brought back seed I had purchased—I was unable to collect any in the field. After examining the seed under a microscope, Longwood informed me it was immature seed and dried-up flower buds. I'm now convinced that the seed we have had in the past at the Arboretum from commercial sources has been in the same condition. I believe we've now located a source in Western Australia from which we shall get viable seed, so we'll give verticordia a whirl again.

Between Carnamah and Perth, we ran across a field containing six species of the genus *Verticordia*, all in bloom at the same time. They are wonderful as cut flowers, lasting several weeks. . . .

Eucalyptus salmonophloia is quite common in many areas of Western Australia and one of the most interesting sky-line trees. If one cuts into the bark at certain times of the year, he will find the pulp to be a beautiful salmon-pink. . . .

Australia is a plant-hunter's paradise. It is approximately the size of the United States, with the population of the state of California, so there are many wide open spaces. During a trip up north to one of the sheep ranches, the owner was most apologetic, "It's too bad you can't see one of the big sheep stations. I have only three hundred and eighty thousand acres."

I should like to pay a tribute to the Commonwealth Scientific and Industrial Research Organization — better known by the initials CSIRO. This Australian organization undertakes everything from atomic energy to pasture grasses, as it is a combination of departments — the department of agriculture, the department of commerce, and so on—and does a magnificent job.

George Spalding, the author, examines a specimen of *Boronia megastigma lutea*.

THE DESCANSO GARDENS STORY

By **John L. Threlkeld**

The camellia collection numbers one hundred thousand plants and attracts visitors from all parts of the world. On a recent weekend visitors came from thirty-eight states and fifteen foreign countries.

Mr. Threlkeld is the Superintendent of Descanso Gardens, a facility of the Los Angeles County Department of Arboreta and Botanic Gardens, of which Dr. William S. Stewart is Director.

DESCANSO GARDENS is a lovely verdant jewel in a setting of hills within a vast metropolitan area—a horticultural center in La Canada, California, operated by the County of Los Angeles Department of Arboreta and Botanic Gardens. The property, which contains a total of one hundred and sixty-five acres, is surrounded on three sides by the beautiful San Rafael Hills, a range in the foothills of the San Gabriel Mountains.

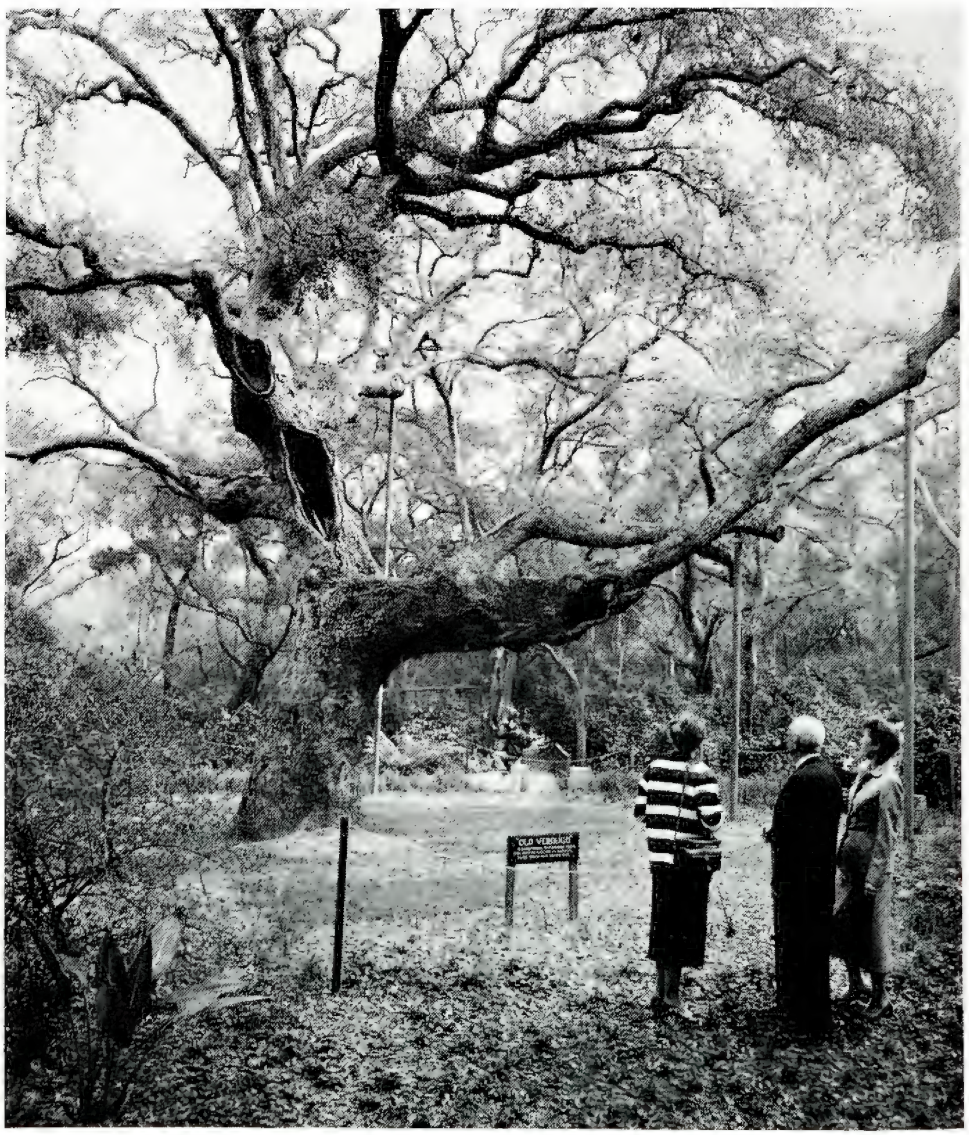
The property is owned by the County to the ridge of the hills, and since these are too steep for residential or industrial use, the garden is adequately protected from encroachment. Approximately one hundred acres are in garden development and parking area, with a total of more than six miles of garden trails. The remaining sixty-five acres contain one of the most varied and interesting stands of chaparral in southern California.

The east slope, which was burned in 1940, shows regrowth of plants characteristic to this situation in California. The north slope, which has not burned since 1883, has a wealth of plant material in the climax stage of plant succession.

Thirty acres of the one-hundred developed acres are in a dense stand of lovely California live oaks. These sprouted and grew after a tremendous fire which swept through the hills in 1883. Before the holocaust the area was covered sparsely with oaks. Since the acorns had fallen before the fire, they survived to bring about the regeneration of the forest in a pattern much thicker than previously.

There are more than four thousand trees in the thirty acres. Their branches, touching and intermingling, form a canopy which has been referred to poetically as a "green cathedral." Thousands of song birds make the canopy their home, and more than one hundred and fifty species have been catalogued.

Gray squirrels also call the forest their home and are to be seen scurrying among the branches or on the ground at any time of the year. The entire area abounds in wild life, from the tiny rodents indigenous to chaparral areas to larger beasts such as coyote, deer, and even an occasional wildcat or mountain lion. The last animals are considered friends of the Gardens, because they keep down the rodent population and control deer herds, and thus make for



"Old Verdugo" is a surviving patriarch from the days of Rancho San Rafael and Rancho La Canada, of which Descanso Gardens is the last remaining acreage. The grant of the famous Rancho was made in 1784 to Jose Maria Verdugo from the King of Spain.

easier gardening. The coyotes are scavengers and clean the area of dead birds and animals which are unpleasant.

A patient observer who has occasion for a nocturnal stroll through the garden is apt to see animals capering in family groups or going very seriously about the business of obtaining their daily food. On one occasion the Superintendent, having worked late, saw nine skunks, some adult and some young, playing or gathering grubs on the lawn.

It is indeed strange how the forest creatures share their domain with human beings. In the twenty-three years that Descanso Gardens has been under development, there has been only one unpleasant encounter between man and beast—when a skunk was provoked by an employee. A truce is established which could very well serve as an example, to the peoples of the world, of co-existence of two communities of entirely different needs.

The original inspiration for the development of Descanso Gardens came to Manchester Boddy, who purchased and united the property in 1937 from several different owners. He envisioned the perfection of the terrain for horticultural development and foresaw that it could always be an island of loveliness and tranquility in the sea composed of the hustle and bustle of the millions of people who populate the Los Angeles basin. The Boddy family home was built near the eastern boundary of the property, high on the north slope overlooking the forest.

Not only did Mr. Boddy have to purchase the land and assemble it from other owners, but he also had to reclaim it from nature. In her fifty years of undisputed domain, nature gained a foothold which she was very reluctant to release. Brush and poison-oak removal came before the days of chemical weed and brush killers, and it was all hard work. Not only was the task itself difficult, but it was also extremely difficult to find workers immune to poison-oak or not afraid to work in it.

The first step in making the forest habitable was the clearing of a roadway through the dense jungle of live oak trees, poison-oak, and brush. The task of roadway clearing was no small job, nor was the task of preparing a home site; but imagine the task involved in clearing a thirty-acre woodland and seventy acres of flat land of poison-oak and underbrush which had been established and growing for more than fifty years.

The poison-oak vines that hung from the trees were as big around as a man's arm. Complete poison-oak plants, competing with the oaks for sunlight, stretched from the forest floor through the top of the trees. It was necessary not only to remove the poison-oak vines and brush, but also to remove the roots so as to prohibit recurrence of the de-

The Descanso Gardens iris collection, occupying three-quarters of an acre, is sponsored by the Southern California Iris Society whose members provide new varieties as these are introduced.

The Rose History Garden features such varieties as 'Neige Parfum', one of the most fragrant roses, and *Rosa gallica*, which is recorded as growing in Persian gardens as early as 1200 B.C.

Hospitality House is a center of horticultural activity the year round. It was formerly the home of Manchester Boddy who founded Descanso Gardens.

spised plants. Roots three inches in diameter, running thirty to fifty feet near the surface of the ground, had to be dug out and destroyed.

After three years the task of clearing was completed, and the first exotic plants were installed.

In transforming a wilderness area into a garden in the arid climate of southern California, consideration had to be given, first of all, to obtaining abundant irrigation water. To accomplish this, Mr. Boddy purchased the Hall-Beckley Canyon, a water-bearing property of two hundred and fifty acres two miles north of the gardens. This canyon winds its way for two miles into the San Gabriel Mountains, and a live stream flows the year round from springs near its top.

Waterbearing tunnels had been developed in the late 1800's to provide water for the few residents of La Canada at that time. The water system was revamped, dams were established to save the stream flow, and the water was then piped to Descanso Gardens, completing the requirements for garden development. At present, more than one hundred thousand gallons of water per day are used in irrigating the Gardens.

At the beginning of World War II, great numbers of Japanese citizens were employed in horticultural and agricultural pursuits in California. Mr. Boddy and his associates purchased upwards of two million camellia plants from Japanese nurserymen who were forced to give up their business because they were interned. Many thousands of specimen plants were planted in the oak forest; thousands of others were placed in containers of various sizes and sold to the nursery trade.

Today, more than one hundred thousand of these plants comprise the main planting of the Descanso oak forest. This is the leader of ornamental camellia-collections in the world. The camellia plantings have been carefully planned to contain choice varieties, but the beautiful old stock is cherished and protected in order that the mass bloom characteristics of the forest can be maintained. Upwards of eight hundred varieties of camellias are represented here. (For a complete discussion see "Camellias in Descanso Gardens," by John L. Threlkeld and Mark J. Anthony in *National Horticultural Magazine,* **36**: 225-252.)

In 1950 and 1951, it was decided to remove the horticultural and agricultural businesses and to develop the entire property as a horticultural showplace, open to the public on a paid-admission basis. Trails were cleared, and an ornamental stream was installed through the Gardens for more than a quarter of a mile.

Many plants other than camellias were grown to give greater year-round interest. Foremost among these were

(Continued on page 152)

Dogwoods and azaleas bank the stream which winds its way for more than a quarter of a mile through Descanso Gardens. Wild mallard ducks find the surroundings pleasant.

THE PLEASURE OF THEIR COMPANY

By **Elisabeth L. Freeman**

Elisabeth L. (Mrs. A. M., Jr.) Freeman, a former student in horticulture at the Barnes Foundation, Merion, Pennsylvania, has been experimenting for the past six years with unusual shrubs in Darien, Connecticut. She must cope with flat ground, few sheltered corners, and impermeable hardpan, but she is achieving satisfactory results, and at the same time introducing some choice plant material to her neighbors.

REMEMBER the big excitement, just a few years ago, about the supposedly new-found hardiness of *Camellia sasanqua*? Hailed as a substitute for the glamorous but tender *Camellia japonica* of the "Deep South", the sasanquas were enthusiastically advertised and sold for gardens from Washington, D. C., to Long Island and Cape Cod. It took only a few seasons to prove that not only were they rather risky, but that, surprisingly, some varieties of *Camellia japonica* were actually hardier than the sasanquas, a fact which some amateurs had been quietly proving in their own gardens as far north as Yonkers, New York, and Long Island, for as much as thirty years. Now there are extensive trials afoot in various arboretums and private gardens, to discover just what is the true range of *Camellia japonica;* some experts believe that it may be nearly that of *Rhododendron maximum.*

A great many desirable plants are apparently hardier than has generally been supposed, but they are not often grown and enjoyed as far north as they might be because the standard horticultural works and the commercial sources of supply are so restrictive in their definitions of hardiness. A discriminating, but freer use of the terms "semi-hardy," "may be hardy," or "possibly hardy north with protection" would extend to many gardeners the sometimes surprising latitude in choice of plant materials that some inquiring and adventurous amateurs have already discovered on their own.

What is meant by "hardy"? To a certain degree, the definition depends on the point of view. The commercial nurseryman is perhaps the most conservative, and understandably so; his plants have to be *really* healthy and winter-resistant without expensive coddling while they are his, and it is to his advantage that they keep on living after they have been planted in all kinds of exposure and conditions by his customers. The New York Botanical Garden, because it is an educational institution, must also be conservative in the information it dispenses to the general public; therefore it lists as "not hardy in this area" many plants that grow and bloom year after year in sheltered areas.

Ilex cornuta burfordii in over seventeen inches of snow, March 1960.

At the other extreme, there is the occasional report of a gardener's triumph in bringing a tender plant through a winter by dint of infinite pains and elaborate methods of protection.

My own interpretation is a fairly hard-hearted one. The plant for experiment, having been given proper soil and drainage, and planted with due consideration for the effects of winter sun and winds, must stand and fight its own battles against freezing cold, sleet, snow, and the vagaries of changeable winter weather. If it lives through several hard winters, continues to make growth, and is a pleasure to the eye, then it is hardy enough to deserve at least a "may-be-hardy" rating, and its name can help to brighten the all-too-familiar lists of standard hardy plants.

Six years ago, I moved a collection of supposedly not hardy plants to Darien, Connecticut, from Philadelphia. Although they were all young seedlings and very small home-rooted cuttings, moved in midsummer when the official temperature in New York was 96°F, and spent the first winter in a deep bed of peat moss, which encouraged an alarming amount of new leaf growth during the late summer and fall, all plants survived the first winter, and at least one of every variety is still thriving, either here or in neighbors' gardens. They have worked out their own salvation with no special protection or coddling, and with such imperturbable good looks that I strongly suspect that most of them could be enjoyed even farther north.

The winter of 1957-58, with its long spells of low temperatures, bare grounds, and freezing winds, was considered a hard one until the infamous winter of 1958-59 set new records. The frost in this area was from five to six feet deep in the ground, and there were long unbroken spells of below-freezing weather, which ended with a drop in temperature from 70° to 24° on one March day and three days of snow and sleet in April. Nurserymen suffered huge losses of well-established plants, such as *Ilex crenata,* peonies, and hosta, and the plants that took that winter in stride deserve to be considered fairly hardy.

Stranvaesia davidiana, one of the most beautiful of the broad-leaved evergreens, thrives here outside an east window, with an eighteen-inch outcropping from a garage as its only protection from the north. It has never had a single leaf or branch-tip damaged by the cold, although in low temperatures its leaves droop slightly. Colorful all year round, it puts out shining russet-tinged new growth in very early spring, which is followed by lavish masses of white bloom, and later, in the fall, by bright rose-colored fruits on long pedicels. Even during the cold days of winter, the shrub glows with the warm color of the few fruits left by the birds, the bright red of a few of the oldest leaves, and the faint brushings of the same color on the under sides of the dark green leaves. *Hortus* says *S. davidiana* "stands in D. C."; I do not know of another north of Philadelphia. The variety *undulata,* with its nearly

prostrate habit, should be even hardier than the typical plant; Bailey says that it "survives to Massachusetts with protection."

Sarcococca hookeriana humilis and *S. ruscifolia,* aristocrats among evergreen groundcovers, are perfectly hardy, with flowers and fruits each season, if grown in full shade. My plants grow along the north wall of a garage, and they survived this past winter without even a mulch. *Skimmia japonica* thrives in the same exposure, with protection from winter winds; in fact, the hot sun of a Connecticut summer was its only problem until it was moved to full shade.

Ligustrum coriaceum (L. japonicum var. *rotundifolium)* is very slow-growing, completely hardy, and keeps its good dark winter color in a fairly exposed nursery bed. *Ligustrum lucidum,* in the same bed, loses a discouraging number of its leaves each winter, though a neighbor's specimen, growing in a protected half-shady spot, looks handsome all winter. *Ligustrum* 'Suwanee River', supposedly hardier than the species *L. lucidum,* has proved exactly the reverse for many nurserymen in this area in the last three winters; yet these two are offered in nearby nurseries, while the better-behaved *L. coriaceum* is not.

Osmanthus ilicifolius, with crisp clean-cut foliage, is thriving in half a dozen or more gardens locally. Even when planted in full sun against a south wall, as mine is, only a few leaves showed a trace of winter burn in 1958-59. Another specimen, planted in a sheltered, half-shaded eastern corner, suffered no damage at all.

Osmarea burkwoodii is apparently hardier than one of its parents, *Phillyrea decora,* which is described in *Hortus* as being "grown in mild and warm states only." Mine faces south and gets all the winter sun without damage, though it grows slowly.

Of a long list of English and Oriental hollies that are being successfully grown as far north as Vermont, I have only a few. *Ilex aquifolium* 'J. van Tol', planted in full sun against an exposed south wall, has not, in six winters, showed any damage to its dark shining foliage and blooms generously, but a two-year old staminate *I. aquifolium,* bought two years ago to ensure fruit, did not survive its first winter here.

Ilex cornuta burfordii, which is growing in the open in a southwest exposure, remains green and glossy and keeps its fruits till March, when the leaves turn dull and many drop off. However, new leaves and tip growth follow closely.

Two young plants of *Ilex aquifolium aureo-marginata* (one bought in a local supermarket) have been equally hardy and free from leaf burn, though one is planted against an east wall in a slightly sheltered position, and the other is growing in an open nursery row.

Ilex pernyi, also in the open nursery, lost a few leaves in the winter of 1958-59, but none this past winter. The tall, narrow form of this beautiful holly should make it particularly good for planting in a corner or in an ell, where its hardiness much farther north might be in doubt. *Ilex ciliospinosa,* one of the hardiest of the Chinese hollies, thrives in a southwest exposure in full sun.

Aucuba japonica, Libocedrus decurrens, and *Buxus microphylla compacta* have been completely undamaged here for the past six winters. A new collection of a dozen rooted cuttings of various hybrid tree box, as well as the new *Ilex opaca* 'Maryland Dwarf', have survived their first winter here with only a light covering of hemlock branches.

Cotoneaster henryana and *Cotoneaster franchetii* must surely be hardy much farther north than Darien, Connecticut, judging by the performance of my three specimens, yet they are not offered by growers in this area. Both varieties, growing in completely exposed spots, keep their leaves and fruits all winter long and give a touch of incomparable grace to the winter land-

Cotoneaster henryana retains its foliage and fruit all winter long in an exposed location in the author's garden. Photo taken in March 1960.

Below. Close-up of foliage and fruit of *C. henryana.*

Ilex aquifolium 'J.van Thol' has wintered well in Darien, Connecticut, for six years. Here it is in seventeen and a half inches of snow, March 1960.

scape as a pleasant relief from the standard broad-leaved evergreens. The dark red leaves and lighter red fruit of *C. henryana* make a handsome winter picture with the rich winter coloring of *Berberis verruculosa* and the purplish tinge of creeping thyme in the foreground.

Berberis verruculosa and *B. triacanthophora* seem to do best in full sun, with a little protection from wind. When planted in shade, the new growth remains tender and green and is apt to freeze back in hard winters. Winter sun also brings out the handsomest coloring, and *B. verruculosa* is particularly attractive in winter arrangements. Two years ago a landscaping committee had to persuade a local plantsman to "import" eight specimens of *B. verruculosa* for a planting in front of the new library. Planted in full sun, facing south, and with no real wind protection, they have more than doubled in size and are handsome and shining all winter long.

One very small plant of *Berberis candidula* has survived three winters here in full sun, and bears a surprisingly good crop of fertile seeds. These I take each fall to a courageous nurseryman who has confidence in their usefulness as landscaping material in Connecticut.

Among the deciduous plants, the most surprising performance of all has been that of *Melia azedarach,* the rapid-growing, umbrella-like Chinaberry tree of the "Deep South." My original seedling, planted in the open nursery with no protection of any kind, grew to a height of eight feet in three years, with partial die-back each winter. It was still stretching when I mistook its unexpectedly large and wandering root for that of an unwanted green ash, and killed it with a mattock. Since then I have planted eighteen more seedlings and learned in the process that the root of this species characteristically turns at a right angle, not far below the surface of the soil, and concentrates its growth in a horizontal direction—no wonder I killed the first one! Most of the new seedlings are now six feet tall, suffer less die-back each winter, and obviously more than make up for it each growing season; I fully expect to sit in the shade of one in another two or three years.

Lagerstroemia indica and *Chimonanthus praecox* have survived the past three winters here with only partial die-back, and I hope to see both bloom eventually. The crape-myrtle, once it is well established, has behaved like a die-back in several unlikely places, including Iowa, where it comes from the ground each year and blooms on schedule. It also blooms at the Arnold Arboretum. One Cape Cod gardener reports a planting of three which have grown to a height of six feet, bloom generously, and do not winter-kill. The deep red-flowered form is reported to be hardier than the pink or white.

Jasminum nudiflorum, undeservedly

Berberis verruculosa has almost doubled in size since it was planted two years ago at the new library in Darien, Connecticut. Photo taken March 1960.

considered too tender for northern nurseries to grow, does well for me against south-facing walls and boulders. I have planted it there mainly to encourage its heart-warming habit of rushing the season with new green leaves and bright yellow and scarlet buds even in February, wherever leaves have drifted over the lowest branches. Buds will open in five or six days when brought indoors in mid-February, and occasionally a few will open that early outdoors in a spell of mild weather. Always "on the edge of spring" right through the coldest winters, this jasmine is hardy enough to ride out the late-winter freezes so disastrous to many other early bloomers.

Jasminum stephanense, much more southern in its range, has laced a stone wall in my garden with its pink blooms for the past five years. It was killed to the ground in the winter of 1958-59, but grew and bloomed again last summer. This one is planted in a less protected spot than any of the *J. nudiflorum,* and with a little help would probably have weathered even that disastrous winter without a set-back.

My ten-foot hardy orange, *Poncirus trifoliata,* grown from seed, never fails to evoke astonishment when it is covered with fragrant orange blossoms or fruit; yet it grows and blooms as far north as the Arnold Arboretum.

Salvia greggii, native in Texas and Mexico, blooms for me till early November and lives through every winter with no protection; and *Verbena phlogiflora,* from southern Brazil and Uruguay, looks alive till well into the winter and seeds itself freely. *Pachistima canbyi,* remains evergreen without a winter covering and seeds freely; the evergreen *Vinca major* will winter here under a light mulch; and even *Serissa foetida* has survived one winter outdoors in Darien.

Albizzia julibrissin rosea, Franklinia alatamaha, Styrax japonica, Elaeagnus pungens, Clematis montana rubens, and *Abelia grandiflora* are all completely hardy in this area, and yet many interested and well-read gardeners have always understood that they are not.

Winter sun and wind, and poor drainage probably do more damage to "semi-hardy" plants, particularly the broad-leaved evergreens, than mere low winter temperatures. And the month of March, with its sudden and extreme temperature changes, and alternately drying and freezing winds, can be the most trying "final exam" of the winter season. A north or east-facing wall protects the evergreens from the deceiving, but short-lived warmth of the afternoon sun and also prevents the too early spring development that would be killed back by a late frost. A moderate circulation of air is better than either a cold air "pocket" or a spot so exposed that winter winds can dry and burn the exposed foliage. Winter mulches are helpful, and a plastic coating, such as "Wilt Pruf," sprayed on the leaves of broad-leaved evergreens prevents the drying and "burning" effects of winter sun and winds. Yet most of my own plants have had to get along without one or more of these helps, because of relatively poor soil and drainage, very limited space for ideal exposures, and pure procrastination this past winter about mulching and using a plastic spray coating. Five of my favorite broad-leaved evergreens *(Osmanthus, Osmarea, Ilex aquifolium, Ilex cornuta burfordii,* and *Cotoneaster franchetii)* must grow in full sun along a south-facing wall, and with no other wind protection; yet they look prime all winter long. No plant of mine has ever had any artificial winter shelter—no winter cocoons, no droopy burlap windbreaks, no board shelters, no plastic screens for my garden! This phobia against artificial winter shelters and their insult to the eye was acquired at the Barnes Arboretum in Merion, Pennsylvania, where many plants are grown north of their supposed range, and where the winter landscape is as beautiful in its own natural way as that of any other season.

Adventurous gardeners can help to broaden the list of choice and unusual plant materials for the North by experimenting with supposedly tender plants, many of which can very likely hold their own against cold winter temperatures. There is always the interesting possibility, too, that some of these "advance-guard" specimens, successfully grown outside their supposed geographical limits, can be bred to produce offspring that will be hardy even farther north. Certain varieties of such exotics as bamboo, pomegranate, passion-flower, and jasmine, to name only a few, have proved unexpectedly hardy well above the Mason-Dixon Line.

And there are still the unexplained phenomena, like the dahlias forgotten in two gardens, in the winter of 1958-59, that lived to grow and bloom again, and the *Ficus pumila,* planted in an opening in the flagstone porch of a house near Philadelphia, that survived four years of freezing, drought, and neglect (while the house stood empty during the war years), and revived to cover the walls again.

And, most incredible of all, a professional nurseryman in Connecticut, with two greenhouses full of special hybrid pansies and primulas, thousands of cuttings of rare alpines, dwarf conifers, and dwarf broad-leaved evergreens, and one lone young oleander, shuts off the heat, drains the water system, and goes to Florida every year for the entire month of January. Sometimes the outdoor temperatures have dropped to eight degrees below zero, and the tiny seedlings and barely-rooted cuttings must weather the low temperatures and the month-long drought; yet less than six weeks later, his thrifty plants and blooms are the envy and despair of his competitors. In the three years he has done this, he has not lost a plant.

There is apparently much to be learned about plant hardiness. The adventurous gardener can help by experimenting with the plants which interest him, and even though they may succumb eventually, in an extraordinarily severe winter, at least he will meanwhile have had the pleasure of their company.

TREE PEONY (from page 136)

several names: *Paeonia suffruticosa (P. moutan), P. lutea, P. potanini,* and *P. delavayi,* among others. It occurs in the southern Himalayan Mountains and in Yunnan, Kansu, Szechuan, Shensi, and other provinces of China. It is also reported to have been found in Manchuria and northern Korea.

Historically, it is considered to be one of the oldest ornamental shrubs. When first reported in the sixth century, it was valued not only for its ornamental but for its medicinal qualities. It is also closely associated with Buddhism. Through their early travels in China and Korea, the Buddhist monks became acquainted with cherries, quinces, apples, and many other ornamental trees and shrubs which they

added to their temple gardens. The tree peony was one of these, and the monks took this cherished plant with them to Japan. They still look upon it as a "sacred emblem of the Land Beyond" and consider as sacrilegious even the careless discarding of a cigarette or ashes on the ground where a tree peony is growing. For more than four hundred years at the Hasa Dera Temple, the roots of the tree peony were steeped and the brew distributed to some three thousand Buddhist Units for healing purposes. According to recent reports, this practice has ceased.

At Hasa Dera Temple some twelve hundred plants, in three hundred varieties, have developed without planning or hybridizing. It is assumed that, with a chromosome count of five, the tree peony is self-improving over the years. As finer qualities have been detected in certain plants, these have been selected for growing-on. In this way a number of persons in the Orient, and particularly in Japan, have been able to introduce tree peonies that are improvements over older varieties. Today about twelve hundred varieties have been named. This has led to confusion and misunderstanding in the Orient and in this country. Fortunately, an effort is being made to bring the interested parties together, and it is anticipated that within a reasonable period of time clarification of the nomenclature of the tree peony will be effected.

The tree peony is found at relatively high elevations; this indicates that it requires a well-drained location. It does not thrive when its roots remain wet for any length of time. It also needs rich sandy loam; and while it does not demand much attention, it responds well to an annual dressing, in the fall, of well-rotted cow manure (if this is obtainable) or of bonemeal.

Propagation is carried on by means of grafting, division, and seed, both in the United States and in the Orient. Grafting is by far the most popular method, and the rootstock used is almost invariably that of the herbaceous or *P. albiflora* types, though *P. moutan* (*suffruticosa*) rootstock offers the possibility of a more responsive plant. Plants propagated by seed are by far the safest to grow. They are, however, not necessarily the most desirable, because they are unpredictable in growth habit and in flower production until they have attained the age and size of expression.

Grafting is usually done at the time the plant has reached maturity, and at which time rootstocks may be taken from other plants without loss. In Japan the whole operation is carried out in the open, and the grafts that take are planted in field rows in early October. Here in the United States growers are less exact on their dates for grafting. Several do it early in September, "heel in" the grafts under glass for from four to six weeks, and then pot those that have taken. The selected roots are necessarily short so as to fit into clay pots, and such plants do not develop as quickly nor as robustly as do full-root, field-grown plants. Each method has its losses; no perfection in graft stands has yet been observed anywhere.

Division of plants is a very slow method of increase, but the surest way to obtain one hundred per cent stands.

I have been experimenting with potted plants for several years and have learned that the tree peony can be grown for a maximum of two years in a container without constant care. The old stand-by clay pots are satisfactory for this purpose; plastic and other nonporous containers cannot be used without extra care. If potted in the late fall, a one-year-old graft (full-root) will grow into an excellent plant by the following September. It will set buds and can be moved without loss of vitality into a new permanent location. Over ninety per cent of potted plants handled in this manner have produced from one to three full-sized blooms.

The potting medium should be gritty and heavily fortified with phosphate. The plants, after having been potted, should be buried to at least four inches below the grafts. The top two inches can be of sharp sand, which provides an excellent mulch, prevents weeds from growing, and has a neat and clean appearance. Two-year-old, pot-grown plants are excellent material to be used in developing tree peony gardens on private or public grounds.

Larger, older, field-grown plants can, of course, be used to create immediate effects. These plants, if carefully dug, balled, and burlapped, respond splendidly. However, dry rootstock plants require extra time to become established, unless much of the top growth is removed. When top growth has been severely cut back, older, bare-root plants have produced some spectacular effects; they have flowered surprisingly well and have produced full-sized blooms, perfect in every detail. Such plants would be considerably ahead, three years hence, of similar plants that were not cut back.

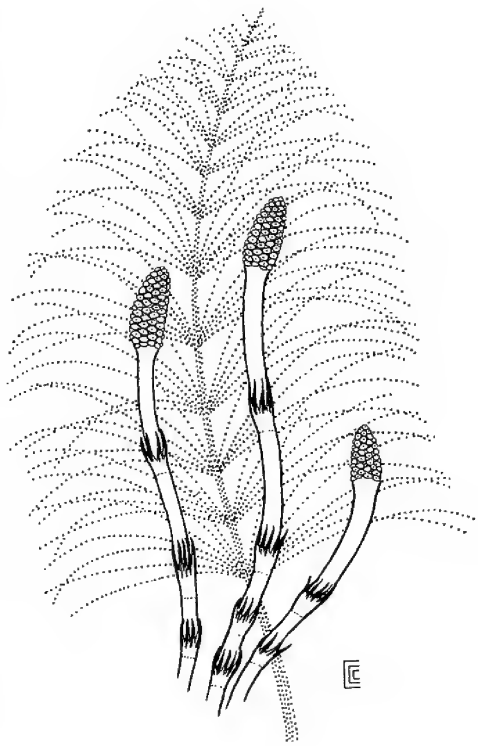
The tree peony is a superb plant for a focal point in garden design, as an accent at the entrance to the house or the garden; or it can be planted effectively as a border along a driveway or in groups against a background of evergreens, lilacs, or an ivy-covered wall.

HORSETAIL (from page 132)

and polishing hardware.

All the reports on the deleterious nature of the common horsetail presumably refer to the sterile aerial portion of the plant. The fertile stem is ephemeral, succulent, translucent, very pale amber or flesh-colored (faintly greenish or yellowish at the solid nodes), longitudinally striate. The sheathing bands are black-brown; the hygroscopic, four-legged spores are green. The fresh stalk has no characteristic taste; it is watery bland. The species is cosmopolitan in distribution.

On May 4 I made a survey of ten vegetable stores along Mott and Pell Streets, in lower Manhattan's China-



town. A cone-bearing stem was shown to the storekeepers, but not one recognized the plant. I also tried three Chinese drug stores, but without success. There were a number of curious, even excited, staring storekeepers and Cantonese cronies, but not one displayed the faintest glimmer of recognition when he saw the cone-bearing stem. The lack of substantial support in literature for the use of the common horsetail as human food, the vacuous experience in the Chinese markets, and the positive knowledge of the weed's noxious effect on grazing animals brought to mind the sham *Actinotinus**. Could it be that my Oriental acquaintance of Van Cortlandt Park was really gathering the horsetail as a medicinal home remedy, say as a diuretic, and had suggested I eat it, merely to exercise a very dry sense of humor? But his sincerity was vindicated. For, in the meanwhile, I had written to the renowned Dr. Yoshiharu Matsumura at Kobe University, and his immediate reply was enlightening. He had knowledge of the palatable qualities of *Equisetum arvense*. Dr. Matsumura wrote that most Japanese everywhere, as far as he knew, eat the sporiferous stem and its cone, except the scale-like leaves. The stems are usually boiled several minutes before they are eaten. Some persons prepare them with rice for lunch—this is said to make a tasty dish; and there are other ways of cooking the stems as 1) boil them with soy sauce and add a little sugar; 2) bake this combination with eggs; 3) broil the stems with seaweed, such as *Laminaria,* in soy sauce; 4) bake on a wire net over a charcoal fire and then steep in soy sauce.

Boys and girls in Japan gather this wild vegetable in the springtime, and doing so is enjoyable play for them.

There are many things to look forward to in spring, the season of the new leaf, and one to which I am looking forward in spring 1961 is a dish of the succulent stems of *Equisetum arvense.*

* The genus **Actinotinus** was proposed by Oliver in 1888 and illustrated in Hooker's **Icones Plantarum.** "One of the most remarkable additions to the Chinese Flora," it was based on a botanical preparation brought back by Dr. A. Henry from the province of Hupeh. A short time after publication, it was discovered to be "a trick played upon us" by one of Dr. Henry's native Chinese collectors, who had artfully inserted the inflorescence of an ampliate **Viburnum** into the terminal bud of an **Aesculus!**

DESCANSO GARDENS (from page 146)

roses, azaleas, rhododendrons, clivias, and iris. The garden was first opened in the spring of 1952 for a brief period, but damage from heavy rainfall and floods necessitated closing it for repairs. The garden was reopened for a few months in 1952, but an adverse financial situation prohibited continuance.

The property was offered for subdivision, but in November of 1953 the County of Los Angeles, Board of Supervisors, purchased it, thereby preserving the magnificent development.

From the date of purchase until July 1958, Descanso Gardens was operated by the County Department of Parks and Recreation on a paid-admission basis. In July 1958, the responsibility for operation was transferred to the Department of Arboreta and Botanic Gardens.

The philosophy of operation was changed from horticultural display to horticultural-botanical education and display, and the admission charges were removed. With the new emphasis on education, a dynamic program has been established, and courses are offered in home gardening, home landscape design, botanical sketching, and floriculture for adults; exploring nature, art in nature, indoor and outdoor gardening, and other horticultural and natural history subjects are offered for children.

Many educational and display activities are promoted throughout the year. The largest one is the annual camellia show presented by the Los Angeles Camellia Council, a group representing six camellia societies in southern California. A daffodil show is sponsored by the American Daffodil Society, and an iris show is presented every other year by the Southern California Iris Society. A "Festival of Garden Lights," which features colorful ideas in lighting adaptable to home gardens, is sponsored by the Descanso Gardens Guild; and a Christmas decoration show, which offers many ideas for home holiday decorating, is also presented by the Guild.

Informal illustrated lectures are given from time to time on various horticultural subjects. Guided tours are provided for both children and adult groups.

The hills are used for nature study for both adult and children's groups. The trails are being continually expanded to create increased interest.

Expansion and refinement of plantings have been accomplished in the years of County operation. The rose garden is now a development of seven acres and contains more than nine thousand plants. This garden depicts the history of the rose from the very earliest known species and varieties to the latest modern introductions.

A cymbidium garden of hundreds of specimen plants has been established in a natural outdoor garden setting. An eastern U. S. A. garden features lilacs and peonies, which are unusual in southern California. Azalea plantings have been expanded and improved, until they are now an attraction which draws visitors from wide areas. The rhododendrons number several hundred plants, and some are as much as fifteen feet in height. Tens of thousands of annuals, perennials, and bulbous plants furnish color each year.

A recent development is the installation of a California native plant garden; it now covers about five acres, but will eventually be twice this size. All the plants have been donated from private sources. The garden has been installed under the direction of a citizens' committee of five men who are experts on native plants.

To assist in the operation and development of Descanso Gardens, the Descanso Gardens Guild was formed in early 1958. The purpose of this organization is to perpetuate Descanso Gardens as a cultural and horticultural center. A schedule of membership has been established. In the short time of its existence, the Guild now has more than three hundred members. It sponsors many garden activities, assists financially and provides many hours of volunteer work. Invaluable assistance is also provided by its efforts in public education on behalf of the Gardens.

A master plan of further development will widen the interest of Descanso Gardens on a local, national, and international scale. Attendance during the 1959 calendar year was more than a quarter of a million persons.

Descanso Gardens with its companion botanical-horticultural facility, the Los Angeles State and County Arboretum in Arcadia, and other botanical developments under way by the Department of Arboreta and Botanic Gardens provide assurance to residents in and visitors to Los Angeles County of expanded horticultural attractions.

BRIEF NOTES ON RECENT BOOKS

By Elizabeth C. Hall

Miss Hall is the Librarian of The New York Botanical Garden.

GARDEN PLANTS AND GARDENS

ANYONE CAN GROW ROSES. Cynthia Westcott. 3rd ed. 197 pages, indexed, illustrated. D. Van Nostrand Co., Inc., Princeton, N. J. 1960. $3.75

Includes the very latest recommendations on insect and disease control.

APPROVED PRACTICES IN BEAUTIFYING THE HOME GROUNDS. Norman K. Hoover. 271 pages, indexed, illustrated. Interstate Printers and Publishers, Dansville, Ill. 1959. $4.00

Information lacks specificity.

CAMELLIAS FOR EVERYONE. Claude Chidamian. 191 pages, indexed, illustrated, part colored. Doubleday & Co., Inc., New York. 1959. $3.95

Simple and useful introduction to camellia culture.

DESERT PLANTS—CACTI AND SUCCULENTS IN THE WILD AND IN CULTIVATION. Oliver and Margaret Leese. 220 pages, indexed, illustrated. Transatlantic Arts, Hollywood-by-the-sea, Fla. 1959. $7.50

Sir Oliver and Lady Leese offer much of interest and help to growers of these desert-loving plants. "Famous Succulent Gardens of the World" is a chapter not to be missed.

EVERGREENS FOR EVERY STATE. How to Select and Grow Them Successfully in Your Locality. Katharine M-P. Cloud. 227 pages, indexed, illustrated. Chilton Co., Philadelphia. 1960. $4.95

Useful features are the regional reports from horticulturists in the United States and Canada.

FUCHSIAS FOR ALL PURPOSES. Thomas Thorne. 175 pages, indexed, illustrated. Translantic Arts, Hollywood-by-the-sea, Fla. 1959. $7.50

A contribution to the literature of the *Fuchsia* in its many species, varieties, and hybrids. Should be of special interest to West Coast gardeners.

GROW CACTI; A PRACTICAL HANDBOOK. Cyril Marsden. 2nd ed., enlarged. 178 pages, illustrated, part colored. St. Martin's Press, Inc., New York. 1960. $4.50

Elementary text designed for cactus fans in Great Britain.

HARDY HERBACEOUS PLANTS. Lanning Roper. 224 pages, indexed, illustrated. Penguin Books Co., Baltimore, Md. 1960. $1.50

A sound treatise on the culture and uses of herbaceous plants in British gardens.

IMMORTAL ROSES. One Hundred Rose Stories and Vignettes of Famous People and Events. Jean Gordon. 170 pages, indexed, illustrated. Red Rose Publications, Woodstock, Vt. 1960. Paper $1.95; cloth $3.95

Fascinating miscellany.

LANDSCAPING WITH VINES. Frances Howard. 230 pages, indexed, illustrated. Macmillan Co., New York. 1959. $6.50

112 genera represented. Excellent descriptive and cultural notes. Relative hardiness indicated.

ORCHIDS FOR HOME AND GARDEN. T. A. Fennell, Jr. Rev. ed. 160 pages, indexed, illustrated. Rinehart & Co., New York. 1959. $3.95

Orchid nurseryman of Homestead, Florida, presents up-to-date revision.

PEONIES, OUTDOORS AND IN. Arno and Irene Nehrling. 288 pages, indexed, illustrated, part colored. Hearthside Press, Inc., New York. 1960. $5.95

Reliable and up-to-date information.

RAISING VEGETABLES. George W. Ware and J. P. McCollum. Rev. ed. 460 pages, indexed, illustrated. Interstate Printers and Publishers, Dansville, Ill. 1959. $6.50

A college textbook with emphasis on truck farming and the vegetable growing industry.

ROCK GARDENS. E. B. Anderson. 176 pages, indexed, illustrated. Penguin Books, Inc., Baltimore, Md. 1959. $1.50

Pictures of scree and dry wall construction, sowing, planting, and propagation.

THE AMERICAN CAMELLIA YEARBOOK. Ed. by Herbert S. Wolfe. 388 pages, indexed, illustrated, part colored. American Camellia Society, Gainesville, Fla. 1959. $6.00

Up-to-the minute cultural notes including gibberellin trials and results.

THE COOL GREENHOUSE. G. W. Robinson. 240 pages, indexed, illustrated. Penguin Books, Inc., Baltimore, Md. 1960. $1.50

The possibilities small greenhouses afford British gardeners are well discussed and illustrated.

THE EVERGREENS. James H. Beale. 285 pages, indexed, illustrated. Doubleday & Co., Inc., New York. 1960. $4.50

Well-illustrated, practical text by the retired superintendent of the arboretum at the Boyce Thompson Institute for Plant Research.

THE GLADIOLUS. 34th annual edition. 264 pages, illustrated. New England Gladiolus Society, Boston, Mass. 1959. $4.00.

This useful annual is national and international in scope.

THE ILLUSTRATED REFERENCE ON CACTI AND OTHER SUCCULENTS. Edgar Lamb. Vol. 2. pp. 319-580, indexed, illustrated, part colored. Pitman Publishing Corp., New York. 1959. $12.50

A wonderful contribution. Invaluable illustrations and text by one of England's greatest fanciers.

THE IRIS. Leslie N. Cave. 2nd ed. 240 pages, indexed, illustrated. St. Martin's Press, Inc., New York. 1960. $7.50

By a knowledgeable British authority.

USEFUL TREES AND SHRUBS. Florence Bell Robinson. A Card File of Data on approximately 500 Hardy Woody Plants in Common Use as Ornamentals. Garrard Press, Champaign, Ill. 1960. $6.00

Originally published in 1938. Concise information on deciduous trees, deciduous shrubs, conifers, broad-leaved evergreens, and vines, which are hardy north of the Mason-Dixon Line.

GARDENING EQUIPMENT AND TECHNIQUES

HYDROPONICS; THE BENGAL SYSTEM. Sholto J. Douglas. 3rd ed. 144 pages, illustrated. Oxford Press, New York. 1959. $1.85

Home and commercial units are described in this new edition on soilless gardening techniques.

MIST PROPAGATION OF CUTTINGS. Patricia Rowe-Dutton. 135 pages, illustrated. Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., England. 1960. Post Free 10 shillings = $1.40

Comprehensive coverage, well illustrated, good bibliography.

SUNSET BOOK AND SUNSET MAGAZINE. Garden Work Centers—Lathhouses, Greenhouses, Potting Areas, Plant Display Coldframes, Simple Shelters, Compost Bins, Tool Storage. 96 pages, illustrated. Lane Publishing Co., Menlo Park, Cal. 1960. $1.75

Primarily for California gardeners.

THE BOOK OF PLANTERS. Robert Scharff. 191 pages, indexed, illustrated. M. Barrows & Co., New York. 1960. $3.50

Information about constructing, planting, and maintaining decorative containers, known as planters, for ornamental plants.

FLOWER ARRANGEMENT

CHINESE FLOWER ARRANGEMENT. H. L. Li. 125 pages, indexed, illustrated, colored frontispiece. D. Van Nostrand Co., Princeton, N. J. 1959. $6.50

This is essentially the same as the fine edition published in 1956, with slight revision and additional illustrations.

CORSAGE CRAFT. Glad Reusch and Mary Noble, 2nd ed. 189 pages, indexed, illustrated, colored frontispiece. D. Van Nostrand Co., Princeton, N. J. 1960. $4.95.

Much new material will be found in this edition.

DESIGN FOR FLOWER ARRANGERS. Dorothy W. Riester. 173 pages, indexed, illustrated. D. Van Nostrand Co., Princeton, N. J. 1959. $7.50

Mrs. Riester, writing from the viewpoint of a sculptor, has made an important contribution to flower arrangement literature.

DESIGN WITH FLOWERS . . . UNLIMITED. Patricia Kroh. 141 pages, indexed, illustrated. Doubleday & Co., New York. 1959. $4.95

Many readers have visited this author's delightful garden in Larchmont, N. Y., and have seen her prize-winning arrangements in New York flower shows. All the flower arrangements pictured in this book were done by Miss Kroh, who is also known as Mrs. Milton B. Freudenheim.

FLOWERS AROUND THE CLOCK. Seiko Hara. 147 pages, illustrated, part colored. David McKay Co., New York. 1959. $4.95

Miss Hara uses the hands of a clock to teach by diagram her method of flower arrangement.

JAPANESE FLOWER ARRANGEMENT FOR AMERICAN HOMES. Mary Badham Kittel. 168 pages, illustrated. Viking Press, New York. 1960. $6.95

Mrs. Kittell has long been associated with the activities of the National Council of

(Continued on page 162)

NEWS, NOTES and COMMENTS

Sarah Gildersleeve Fife Memorial awards were presented at the annual meeting of The New York Botanical Garden on May 24, 1960. Mrs. Melvin E. Sawin, acting on behalf of Mrs. William Davis Miller, Chairman of the Committee on the Sarah Gildersleeve Fife Memorial, said: After the death of Mrs. Robert H. Fife, whom many of you knew as a long-time chairman of the Advisory Council and others as a founder of the Hroswitha Club, which latter position presupposes an absorbing interest in rare books, a group of her devoted friends created a memorial in her honor.

The memorial takes the form of annual awards to individuals—experts in the fields of exploration, horticulture, botanical literature and allied subjects.

Members of The New York Botanical Garden have won the award three times over.

The memorial terminates this year with three individual awards, and the large trophy that is now on display in the rotunda of the Museum and Administration Building will remain in the new library wing as a permanent memorial to Sarah Gildersleeve Fife.

It is always a pleasure to bestow an award that is well deserved. Mrs. Mortimer J. Fox's accomplishments and her reservoir of horticultural knowledge place her in the front ranks of those who have stood for better gardening in this country. She is known internationally for her work with lilies and herbs and for her distinguished books. She has served on the Board of Directors of the New York Horticultural Society, the Advisory Council of The New York Botanical Garden, and the Herb Society of America, where her interest in the library collections has been constructive and inspiring. Sarah Gildersleeve Fife—who was her admiring friend—would surely be happy that this award, given in her memory, is bestowed in gratitude and appreciation to Helen M. Fox.

It is a great pleasure to announce that one of the Sarah Gildersleeve Fife Memorial awards for 1960 has been given to Lanning Roper for his beautiful book, *The Gardens of the Royal Park at Windsor,* with a foreword by David Bowes Lyon, V.M.H., President of the Royal Horticultural Society, and published by Doubleday and Co., New York. It is an interesting account of the redesigning of the gardens and the creating of the woodland gardens by His Majesty King George VI with the assistance of the Deputy Ranger, Sir Eric Savill. The illustrations, especially the colored prints, are not only lovely beyond words but, technically and artistically, works of art.

Mr. Roper is an American who studied horticulture in England and became a knowledgeable and skilled gardener and a valued member of the editorial staff of The Royal Horticultural Society. This book is an important and charming contribution to the knowledge of garden design.

For his long record of distinguished service as teacher, scholar, naturalist, and author; for his numerous nature books which have given hours of pleasure and profit to a vast public; and for *The Gardener's World*—a master anthology of incomparable beauty and erudition—the Sarah Gildersleeve Fife Memorial Committee is happy to bestow upon Joseph Wood Krutch this award for 1960.

Distinguished Service Awards. At its annual meeting on May 24, 1960, The New York Botanical Garden presented Distinguished Awards to Helen Morgenthau (Mrs. Mortimer J.) Fox, the Honorable Thomas C. Desmond, Gilbert Holland Montague, and Henry de la Montagne. The citations follow:

To Helen Morgenthau Fox gardening is a way of life, and in the branch of horticulture devoted to the growing of herbs, Mrs. Fox is pre-eminent.

"Fox Den," the family estate near Peekskill, New York, was long noted for its perennial borders and its rock garden. Here Mrs. Fox first developed her famous herb garden which she installed to study and do research for writing books on herbs.

Her interest in herbs that became a lifetime hobby gained for Mrs. Fox an international reputation as an outstanding authority. Mrs. Fox also specialized in the culture of lilies, tulips, and American native plants.

She has traveled widely in search of plants and has written extensively on the subject of gardening. Her interest in lilies, in particular, has added richly to our knowledge of them; this was recognized by the Royal Horticultural Society's invitation to Mrs. Fox to attend the Lily Conference in London in 1933 and to act as judge.

Her present home in Mt. Kisco, known as "High and Low," is a mecca for plant lovers with whom it is her delight to share her beautiful garden and enthusiastic interest in plants.

At The New York Botanical Garden, Mrs. Fox serves as a member of the Advisory Council. As a member of the New York Unit of the Herb Society she has advised and assisted in the establishment of an Herb Garden and in its maintenance; and she has contributed to *The Garden Journal.* In addition, Mrs. Fox has given much to the Botanical Garden Library in advice, books, and substantial contribution to the proposed new library wing.

In recognition of her achievements in the field of horticulture, her writings, and her outstanding services to The New York Botanical Garden, this Distinguished Service Award is presented to Mrs. Fox by order of the Board of Managers.

Engineering, government, arboriculture, each a career in itself, yet the Honorable Thomas C. Desmond has won recognition in each field.

After his B.A., magna cum laude, from Harvard University in 1908 and a year later his degree in civil engineering from the Massachusetts Institute of Technology, Mr. Desmond began his engineering career with work in the construction field in different parts of the United States. In 1914, he formed his own firm, Thomas C. Desmond & Co., engineers and contractors, of which he has since been president, though he is now retired from active engineering practice. While constructing the New York Subway System, he became a friend of Theodore Roosevelt, memories of whom are cherished by Mr. Desmond. "Teddy" Roosevelt re-awakened Mr. Desmond's interest in nature and stimulated his interest in government.

For twenty-eight years, 1930-1958, Mr. Desmond faithfully served the State of New York as Senator, representing the 33rd Congressional District, originally the Counties of Rockland, Sullivan, and Orange, now the Counties of Rockland and Orange.

He dedicated his estate at Newburgh, New York, to a beautiful arboretum containing over four thousand trees, shrubs, and woody vines in almost nine hundred species, suited to the Newburgh area. In recognition of this fine accomplishment, Mr. Desmond was awarded, in 1950, the silver medal of the Federated Garden Clubs of New York State, Inc., and the gold medal of the Massachusetts Horticultural Society.

Membership in many scientific, professional, educational, and philanthropic organizations, in several of which he has held office, testifies to Mr. Desmond's broad and diversified interests. Especially interested in scouting, he is a member at large of the National Council of the Boy Scouts of America and the recipient of its Silver Antelope Award. In April 1956 he addressed a gathering of Boy Scouts and Girl Scouts, assembled at The New York Botanical Garden for Arbor Day exercises. Mr. Desmond is a Director of the Arbor Day Association.

Mr. Desmond has been seriously concerned about the problems of the aged, and in 1957 he received the annual award of the Gerontological Research Foundation.

Other honors conferred upon him from time to time include the 1956 Brotherhood Award and, in 1952, the Silver Stein Award of the Massachusetts Institute of Technology.

In recognition and appreciation of his interest in arboriculture and horticulture, and especially for his interest in and substantial support of The New York Botanical Garden, of which he has been a Fellow for Life since 1955, and a member of the Board of Managers since October 1954, The New York Botanical Garden gratefully presents to the Honorable Thomas C. Desmond its Distinguished Service Award.

Gilbert Holland Montague, a distinguished member of The New York Bar for many years and a member of the Board of Managers of The New York Botanical Garden since May 1952, was born in Springfield, Massachusetts, on May 27, 1880.

Mr. Montague has lectured at Columbia, Yale, Harvard, University of Michigan, and other educational institutions and contributed many articles to magazines on legal, economic, and business questions. His talent, however, was not limited to these. His excellent article in the January-February 1954 issue of *The Garden Journal* of The New York Botanical Garden on "The Extraordinary Judge Addison Brown" should be read by all who know and love The New York Botanical Garden. Mr. Montague was also one of the first, generous contributors to the Library Fund.

In honoring Gilbert Montague we must also honor his deceased wife, the former Amy Angell Collier, whom he married on October 3, 1907 and who passed away on September 22, 1941. Mrs. Montague was an excellent gardener and plant-lover in her own right. A member of the Advisory Council from March 1938 until her demise three years later, she was a frequent visitor to The New York Botanical Garden and often ate lunch with some of the staff members. Mrs. Montague also served as president of the Mt. Desert Garden Club in Maine.

For many years, the Montague estate "Beaulieu" at Seal Harbor, Maine, was

famous for its delphiniums, many of which grew from nine to eleven feet high.

In presenting this Distinguished Service Award to Mr. Montague, The New York Botanical Garden honors a truly eminent lawyer, a generous benefactor, and an individual member of the Board of Managers.

In presenting its Distinguished Service Award to Henry de la Montagne, we can appropriately emphasize Webster's definition of service: the performance of labor for the benefit of another. Mr. Montagne has always worked for the benefit of others; he still does; he always will.

The record tells us that his has been a labor of love, for Mr. Montagne began working for the Garden even before he was on its payroll—and now that he has retired, he is working as hard as ever.

Mr. Montagne's formal association with the Garden goes back to 1919, when he was elected Assistant Treasurer, but as early as 1906 he was already actively involved in the affairs of the Garden. At that time he frequently carried papers from downtown New York to the Garden for his company's president, James A. Scrymser, who helped found the Garden in 1891 and later served as Treasurer.

Elected to the Board of Managers in 1929, Mr. Montagne has served longer than any other of its members, past or present.

The Advisory Council of The New York Botanical Garden held its annual meeting at the Garden on April 21, 1960.

Top. Dr. William C. Steere, Director, talks to representatives of the press about the exhibit, "The New York Botanical Garden and What It Offers You," arranged by the Display Committee headed by Mrs. Charles Burlingham. The exhibit illustrates the Garden's programs of exploration, research, and education; the Library, Herbarium, and other activities; and special plantings. Also on display are medals, trophies, and certificate awards presented to The New York Botanical Garden, and books written by the staff.

Center. Louis P. Politi, Horticulturist, explains some replanting in the Thompson Memorial Rock Garden.

Bottom. Members of the Advisory Council and guests are ready for a tour of the grounds in the "Floral Flyer."

Since 1937 he has been Secretary of the Board, producing the accurate and readable minutes, memorials and memoranda that we have come to associate so happily with him.

Before his retirement in September, 1958, which he characteristically delayed in order to help indoctrinate a newly arrived Director, Mr. Montagne was Business Manager and Assistant Director, and is presently Assistant Director Emeritus as well as Secretary. His titles through the years, like his good attributes, are too many to enumerate. But the one attribute that stands out above all and that must be mentioned is his distinguished and devoted service to others.

We honor ourselves when we present the Garden's Distinguished Service Award to Henry de la Montagne.

The reports of the President, Charles B. Harding, and of the Director, Dr. William C. Steere, have been mailed to members of the Garden so are not included in these pages.

Funds for Library Wing. About a year ago, the Board of Managers of The New York Botanical Garden decided that a new library wing was absolutely essential for the preservation of our great Library. After much consideration, the architectural firm of Eggers and Higgins was selected, and preliminary plans for the library wing were drawn. These plans inevitably led to the need for funds in the amount of one million dollars for the construction of this wing, and Mr. Harding asked me to be the chairman of the fund-raising. At this point, I want to say that no chairman ever had more support and help than I have had. A task which I undertook in fear and trembling has been one of the happiest experiences in my life. The Garden undertook to raise $500,000 with the hope and informal understanding that the City of New York would match our $500,000 with another $500,000, as it has often done for capital expenditures of similar city-supported institutions. Our first appeal to the membership of the Garden went out in September, and the response was overwhelming. We have also received wonderful support from Foundations.

I returned from three weeks in Europe on Friday, and the first letter I opened was from the Federated Garden Clubs of New York State, Inc., which contained a most generous gift. Can you imagine a happier welcome home! We have now received monies somewhat in excess of our goal, and, if the City matches our $500,000, our excess may be used as a greatly needed endowment to maintain the Library.

None of this fund-raising would have been possible without the wonderful effectiveness of Dr. Steere with Foundations and without Mr. Harding's constant help and untiring efforts. Mr. de la Montagne has kept meticulous records of every cent we have received.

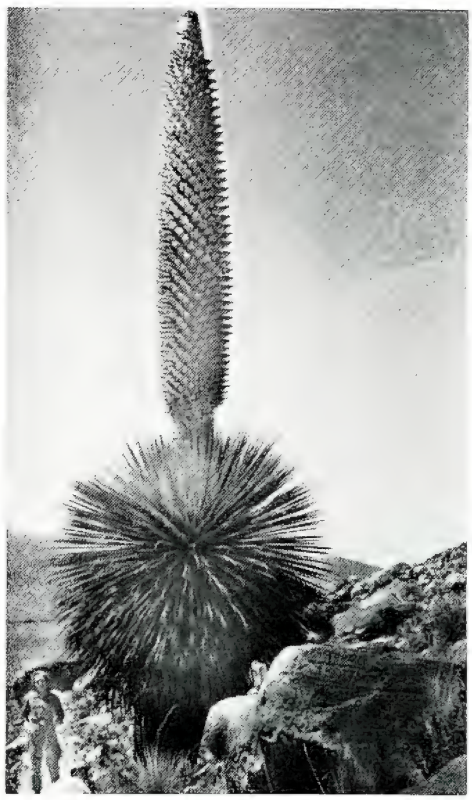
I could not close my report of eight months of fund-raising without thanking the Garden for having given me an opportunity to share in this happy and greatly needed project—our new library wing.

ANGELA M. PLACE
(Mrs. Hermann G. Place)
Chairman

Activities of the Director and staff. During the past several months, Dr. William C. Steere, Director, addressed the New York Association of Teachers of Biological Sciences, the Newcomers Group of the Women's Club of Bronxville, the Somerset Hills Garden Club, the Torrey Botanical Club; attended the Conference of Biological Editors in Cleveland, Ohio, the meetings of the Study Groups on Communications in Biology of the American Institute of Biological Sciences in Berkeley, California, the dinner meeting of the Research Advisory Committee of the Boyce Thompson Institute for Plant Research at Yonkers, New York, the annual luncheon of the Park Association of the City of New York; and visited the Barnes Arboretum at Merion, Pennsylvania, and Cedar Brook Park, Plainfield, New Jersey.

Dr. H. W. Rickett, Acting Assistant Director (Botany) lectured before the Bronxville Garden Club and the International Garden Club in April. Dr. Rickett sailed for Europe on May 16; he consulted with Dr. F. A. Stafleu at the University of Utrecht and then enjoyed a vacation abroad until the end of June.

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, gave a seminar on tropical plant distribution at the Boyce Thompson Institute for Plant Research in April and participated in the Conference on Tropical Botanical Problems of Concern to the United States at Miami, Florida, in May under the auspices of the National Academy of Science and sponsored by the National Science Foundation. Dr. and Mrs. Maguire sailed on May 12, 1960, for another expedition to northern South America. They were joined in June by Dr. Stephen S. Tillett and Mrs. Tillett in British Guiana and will be joined later in Brazil by Dr. Howard Irwin and Lubbert Westra. Dr. Irwin was appointed Research Associate of The New York Botanical Garden on July 1, 1960 and will work on the tropical program under Dr. Maguire.



Puya raimondii is about forty feet tall. Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research of The New York Botanical Garden, found this plant in the Andes near La Paz, Bolivia, at an altitude of thirteen thousand feet. He brought back seeds in March 1960 to learn if they will germinate and grow in this part of the world. Seeds of this vegetable sown at the Garden have germinated. If the seedlings continue to grow, their growth and requirements will be studied.

Dr. P. P. Pirone, Plant Pathologist, talked recently before representatives of the Claims Departments of the Long Island Lighting Co. and the Brooklyn Gas Co.; discussed lawn problems with County Agricultural Agents of New York State when they visited the Garden in April; and prepared charts depicting important diseases and pests of ornamentals and their control for members of the Inter-Community Garden Club to display at the first flower show of Junior Garden Groups in New Rochelle, New York, on May 14, 1960.

Dr. David J. Rogers, Curator of Economic Botany, attended the IBM School on computer programming in April and the annual meeting of the Society for Economic Botany at Purdue University, Lafayette, Indiana, in May. Dr. Rogers was Program Chairman of this event. Dr. Rogers spent the month of June in Jamaica and Brazil, under a UNICEF grant, collecting leaves of certain plants for analysis for their possible nutritional value.

Dr. Marjorie Anchel, Research Associate, has obtained a license to work in radioisotopes in the Research Laboratory. Dr. N. Valenju is presently working with Dr. Anchel under a grant from the National Science Foundation.

Dr. Alma Barksdale, Research Associate, and her husband, Dr. Lane Barksdale, Associate Professor of Microbiology at New York University Medical School, will leave on August 17 for Kyoto, Japan, where they will be for one year. Dr. Barksdale will collect water molds from Japanese lakes and continue her studies of these molds in the Botany Department of Kyoto University. Her husband will carry on his research in the Virus Institute of the University.

Dr. Richard M. Klein, Alfred H. Caspary Curator, delivered a talk on "Effects of Red Light on Plant Growth" before the Biology Department of Queens College in April and presented a paper on "Plant Tissue Cultures in Economic Botany" at the annual meeting of the Society for Economic Botany at Purdue University in May.

Dr. Herman F. Becker, Visiting Research Associate, lectured on paleobotany before two classes of the Roslyn (Long Island) Junior High School. Dr. and Mrs. Becker left for Europe and the Near East on June 17. The trip, primarily professional, included a lecture on North American paleobotany at the Hebrew University in Jerusalem on June 23 and exploration for plant fossils in the Negev. Paleobotanists and their collections will be consulted in Freiburg, Tübingen, Frankfurt, Wuppertal, Paris, Liège, Stockholm, and Uppsala. A paper on "New Tertiary Species from Montana" will be presented at the meetings of the Twenty-first International Geological Congress in Copenhagen, August 15-25. Dr. and Mrs. Becker will return to the United States by jet from Denmark on September 2.

Louis P. Politi, Horticulturist, attended a meeting of the American Rhododendron Society at Pines Lake, New Jersey, and a meeting and show of this Society at "Planting Fields," Oyster Bay, Long Island, in May. Mr. Politi was a judge at the show.

Howard W. Swift, Assistant Curator of Education, prepared the fine brochure, "Notes on the Gardens Visited," for the 1960 Spring Garden Tour.

Dorothy Ebel Hansell, Editor of *The Garden Journal,* attended the previews of the exhibits, "The Symbol of the Rose in Textile Design" and "Flowers in Art," at the Scalamandrè Museum of Textile and the galleries of French and Company, respectively; the meeting and banquet of the Holly Society of America in Philadelphia and the two-day meeting of the American Rock Garden Society in Salisbury and Falls Village, Connecticut; participated in the visit of the Garden Writers' Association of America to Sterling Forest Gardens and the tour of the Garden Club of New Jersey to historic Morristown and environs. Mrs. Hansell also attended the lecture on "English Gardens" given by Mrs. Oakley Sheldon before the City Gardens Club in the headquarters of the National Audubon Society. Mrs. Sheldon is donating her lecture fees to the fund for the new library wing at the Garden.

Staff Seminars. Dr. David J. Rogers, Curator of Economic Botany, and Sidney Gould addressed a staff seminar of The New York Botanical Garden on "Cataloguing Botanical Information by Machine Methods" on April 22, 1960; Frank C. MacKeever, Custodian of the Herbarium, related his experiences in botanizing on Nantucket at a staff seminar on May 16, 1960; and Philip Alampi, Secretary of Agriculture of the State of New Jersey, was the speaker at the seminar on June 1, 1960.

1960 Summer Institute for High School Students at The New York Botanical Garden started on July 11 and will continue through August 12. Dr. Arthur Cronquist is directing the Institute, with the assistance of George Schwarz, biology teacher at the Forest Hills (New York) High School.

Members of the staff who are the Institute's instructors are T. H. Everett, Assistant Director (Horticulture) and Curator of Education, Dr. Richard M. Kline, Alfred H. Caspary Curator, Dr. P. P. Pirone, Plant Pathologist, Dr. David J. Rogers, Curator of Economic Botany, Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, and Dr. Annette Hervey, Research Associate.

Guest instructors are Dr. Theodore M. Barkley, Instructor at Occidental College, Los Angeles; Dr. David E. Fairbrother and Prof. Murray Buell, both of the Department of Botany, Rutgers University; Dr. James L. Brewbaker, Plant Geneticist, Brookhaven National Laboratories; and Dr. L. G. Nickell, Head of the Phyto-Chemistry Laboratory of Chas. Pfizer & Co. Inc.

Garden Aids Gifted Young Science Students. The New York Botanical Garden has long had a tradition of aiding gifted young science students and directing them towards careers in plant science. The Education Department and the Summer Institute have been active in this work.

Each year for the past five years, Dr. Richard M. Klein, Alfred H. Caspary Curator, has chosen one student from the high schools of the City of New York to work with him on a research project for the various science fairs and national science competitions. The student is selected on the recommendation of teachers and following interviews with the student and teachers, and many applicants are screened.

Once selected, the student, the teacher, and Dr. Klein consider research projects which will be within the capacity of the student and the physical facilities of the school. The problem chosen must in all cases be original research so that the student can make a real contribution to plant science, in addition to acquiring new techniques and concepts, as well as a "feeling" for research. It is so planned that the student must really work hard to finish the project.

Above. Emarita Caputo and the exhibit based on her study of the influence of zinc on the growth of plant tumor tissue cultures, using radioactive zinc.

Right. Miss Caputo at work in the precision instrument room in the Research Laboratory of The New York Botanical Garden.

Several years ago a student from Hunter High School, Helen Worms, studied the effect of cancer-inhibiting drugs on the initiation and development of plant tumors, and won an honorable mention in the Westinghouse Science Competition. This year, Emarita Caputo, of St. Thomas Aquinas High School, studied the influence of zinc on the growth of plant tumor tissue cultures, using radioactive zinc. The problem is of particular interest in view of the presumed interrelation between zinc and the synthesis of plant hormones. Miss Caputo was awarded one of the ten grand prizes in the Science Fair competition of the City of New York sponsored by Science Service and local newspapers. Miss Caputo also won a fourth prize in her group at the International Science Fair in Indianapolis, Indiana, in May 1960. She also won second prize at the Catholic Science Fair of New York City and was offered a scholarship at Marymount College to continue her education.

Dr. P. P. Pirone, Plant Pathologist of The New York Botanical Garden, reports that a tiny scale insect *(Fiornia externa)* has invaded the lower Hudson Valley and Long Island and is threatening the life of hemlock trees and shrubs. While the insect's depredations have not yet become alarming, Dr. Pirone warns householders to be on the lookout and to prepare for instant defensive action. The insect settles on the under side of hemlock needles and sucks juice from them, eventually killing the tree or hedge. On an estate in Rye, New York, more than thirty trees have been damaged or destroyed.

Entomologists at Cornell University, who are currently experimenting with control materials, plan to test them on Long Island this summer. Dr. Pirone states that the use of malathion has been only partially effective. He recommends one tablespoon of malathion liquid mixed with one gallon of water and that the spray be applied frequently throughout the growing season. The insect must be attacked in the "crawler" stage, and the timing of the spray application is extremely important. After the "crawler" stage, the mature insect develops a hard protective scale.

In contrast with other insects, the hatching season of *Fiornia externa* appears to extend over a long period with peaks in late June and in September.

Needles on hemlocks first turn yellow, and the tree owner may be misled to believing that this is caused by dry weather or spider mites. The tiny brown insect looks to the naked eye like rust. However, says Dr. Pirone, it can be flicked off the leaf with the finger-nail—a quick way of establishing the presence of the enemy.

Fiornia externa was first reported in Towson, Maryland, around 1920 and later in the 1920s appeared in Queens County, New York. Its origin is unknown. The reasons for its sudden numerical increase are also not yet known.

Fiornia externa on the under side of hemlock needles. (Greatly magnified).

There have been reports of its appearance on yews and fir growing near hemlocks.

The Rose Garden at the New York Botanical Garden has been, since the early 1920s, an outstanding attraction for those living in and around New York City and for visitors from afar, all of whom have enjoyed its wide range of types and varieties of roses. The Rose Garden contains approximately seven thousand plants which include ninety varieties of Hybrid Teas and Grandifloras, thirty-six varieties of Floribundas and Polyanthas, sixty-six varieties of Climbers, seventy-five Hybrid Perpetuals, and fifty old-fashioned kinds. All are identified with a prominent name plate. Among the above are forty varieties which have been All-America Award winners; the two newest All-America Award winners are 'Pink Parfait' and 'Duet'.

Through the years some twenty-five thousand rose plants have been donated to the Rose Garden by the late Lambertus C. Bobbink and there is, in the Garden, a bronze plaque honoring this man who is largely responsible for the widespread use and successful culture of roses.

Since his death in 1950, his daughter Dorothea Bobbink White has continued to donate rose plants and has assisted Louis P. Politi, Horticulturist, in arranging the plantings. For the past several years rose plants have also been donated to the Rose Garden in Mr. Bobbink's name by his friends Charles Perkins, J. Audrey Armstrong, Sidney B. Hutton, A. Vanderkraats, and Charles Burr.

Rose Day is an annual event at The New York Botanical Garden, and the eighteenth Rose Day was held on June 7, 1960. Guest experts, under Howard W. Swift, Assistant Curator of Education, were in the Rose Garden during the morning hours to answer visitors' questions. In the afternoon they participated in the clinic on roses with T.H. Everett, Assistant Director (Horticulture) and Curator of Education as the moderator.

Dr. William C. Steere, Director, in welcoming the visitors to the Garden at the afternoon session, told them that horticulture was an important segment of The New York Botanical Garden and that under the direction of Mr. Everett the living plant collections were being built up. The iris display was magnificent this year; many members of the American Iris Society have contributed plants to enhance the iris borders in preparation for the 1961 meeting of the Society at the Garden. The American Iris Society was organized in 1920 at The New York Botanical Garden with the assistance of Dr. H. N. Gleason, Head Curator Emeritus.

Dr. Steere spoke of the redesigning and replanting of the Herb Garden with the cooperation of the New York Unit of the Herb Society of America and the expansion of the peony collection through the cooperation of the officers and members of the American Peony Society. He stated that the extensive dahlia crescent had been developed with the aid of the officers and members of the American Dahlia Society, and that the New York Botanical Garden had become this year a trial garden of the American Dahlia Society. He concluded his remarks with reference to the Rose Garden in which his audience in the assembly room of the Snuff Mill was particularly interested, and which was in splendid condition for Rose Day.

The first annual meeting of the Society for Economic Botany, held at Purdue University, Lafayette, Indiana, May 21 and 22, 1960, was extremely successful. The speakers, prominent in their respective fields, were excellent, the topics pertinent, the discussions stimulating. The subject of the presidential address, given at the dinner on the first day by Dr. Ernest Guenther, Vice President of Fritzsche Bros., New York City, was "Essential Oils in Africa." Dr. C. O. Erlanson, Chairman of the Society's Council, presided. The members and their guests were entertained before the dinner by Smith, Kline and French of Philadelphia, B. B. Penick Co. of New York City, and Chas. Pfizer & Co. of Brooklyn, New York.

Dr. David J. Rogers, Curator of Economic Botany of The New York Botanical Garden, was Chairman of the symposium on "Integrated Research in Economic Plants —Drugs and Essential Oils," and Dr. L. G. Nickell, Head of the Phyto-Chemistry Laboratory of Chas. Pfizer & Co. and Dr. Heber W. Youngken, Jr., Dean of the College of Pharmacy, University of Rhode Island, were the leaders. The topics were well developed: "Tapping our Heritage of Medical-Botanical Folklore" by Dr. Richard Evans Schultes of Harvard University; "New Crop Development" by Dr. P. F. Knowles of the University of California at Davis; "Plants as Sources of New Drugs" by Dr. Robert F. Raffauf of Smith, Kline and French; "Biological Activity Screening for Plant Drugs" by K. K. Chen of Ely Lilly, Indianapolis; and "Production of Essential Oils from Peppermint and Spearmint" by Dr. N. K. Ellis of Purdue.

SPRING GARDEN TOUR

The prominent plantings on the campus of Princeton University, at "Prospect," the residence of Dr. Robert F. Goheen, President of the University, and Mrs. Goheen, and in the gardens of Dean and Mrs. Donald R. Hamilton at the Graduate College; and a few of the beautiful private gardens in the community composed the 1960 Spring Garden Tour.

The annual tour is sponsored by the Volunteer Associates of The New York Botanical Garden, and this year's arrangements were capably handled by Mrs. Randolph C. Harrison, Chairman, Mrs. Daniel D. Dickey and Mrs. John C. Williams, Co-chairman, and Mrs. Robert Wright, Chairman of Hostesses. Other committee members included: Mrs. Hans Bauer, Mrs. Dudley B. Bonsal, Mrs. John F. Donoho, Mrs. Moore Gates, Mrs. Robert F. Goheen, Mrs. Samuel Hamill, Mrs. Madison H. Lewis, Mrs. Richard V. C. Lindabury, Mrs. William D'O. Lippincott, Mrs. Frederic Milholland, Mrs. Fergus Reid, Jr., Mrs. Henry Savage, Mrs. C. M. Schluter, Mrs. Albridge C. Smith III, and Mrs. John G. Winchester.

From the four and a half acres originally given by Nathaniel FitzRandolph, a resident of the town, the area now occupied by Princeton University has grown to eleven hundred acres. Much of the original landscape design and planting were done by the late Beatrix Farrand, noted landscape architect. Her knowledge of plant material and her talent for selecting the out-of-the-ordinary plants and using them in interesting ways are evident here. Mrs. Farrand was succeeded by the late Alfred Geiffert, Jr., and now Marklie Stevenson is the landscape architect and James Clark the horticulturist.

The walled garden at the home of Mr. and Mrs. Bernard Peyton, Princeton, New Jersey.

Path leading from the home of Mr. and Mrs. David H. McAlpin at Princeton, New Jersey, into their woodland below.

In a previous issue of *The Garden Journal* (Vol. 9:175-178) some of the plants at Princeton University were mentioned and illustrated, so we shall name only a few which particularly attracted the attention of the visitors on the tour on May 12, 1960: the purple-leaved hazel *(Corylus avellana atropurpurea)* espaliered on the wall of Foulke Hall; the large-leaved ivy *(Hedera colchica)* from the Caucasus, more often seen in southern than northern gardens; Japanese wistaria *(W. floribunda macrobotrys)*, with very long flower clusters; the tamarisk *(Tamarix parviflora)*, whose feathery dusty pink racemes were so appealing above a grey stone arch of the Graduate College; *Viburnum carlesi* and *V. fragrans* espaliered on the wall at the gateway to the Dean's residence at the Graduate College; the dawn redwood *(Metasequoia glyptostroboides)* at "Prospect," one of the largest specimens in this part of the country.

Within the courtyard garden at the home of Mr. and Mrs. Harold Hochschild were some interesting plants: *Mahonia bealei, Nandina domestica, Sarcococca hookeriana, Camellia sasanqua,* and *Pernettya mucronata* which are not considered as being reliably hardy in this area. Three species of *Helleborus, H. foetida, H. niger,* and *H. orientalis,* were also observed in this attractive courtyard planting. The brick house was designed by Francis A. Raudebush to obtain views of Marquand Park.

Marquand Park has a wealth of magnificent trees—fine old specimens which were planted far enough apart to allow for their full development. This park was once a part of "Woodlawn," the estate of Judge Robert Field, and was designed in 1842 by John Notman in the English manner with sweeping lawns, specimen trees, and long vistas. Petry, who had worked with James Paxton at "Chatsworth," the estate of the Duke of Devonshire, was in the employ of Commodore Stockton at "Morven," and he imported trees from Europe and planted them at "Woodlawn" for Judge Field. After Professor Allan Marquand bought "Woodlawn" in 1885, Mrs. Marquand continued the planting of rare trees and shrubs. The Borough of Princeton acquired sixteen acres of this estate, which are administered by the Park Committee as a community project.

As Marquand Park was the scheduled stop for a delicious box lunch, there was not time to explore and locate all the fascinating trees whose names appeared on the map prepared by the Garden Club of Princeton. But we did see China fir *(Cunninghamia lanceolata)*, Chinese scholar tree *(Sophora japonica)*, Amur cork-tree *(Phellodendron amurense)*, blue Nootka and weeping Nootka cypresses *(Chamaecyparis nootkatensis glauca* and *C. nootkatensis pendula)*, dove tree *(Davidia involucrata)*, Oriental and Serbian spruces *(Picea orientalis* and *P. omorika)*, incense cedar *(Libocedrus chilensis)*, and Cilician fir *(Abies cilicica)*.

Mrs. L. F. Stafford's garden is a good example of how a small town-property can be developed to provide year-round interest and to curtail the maintenance problem. The delicate-colored tulips against the lilac hedge were enchanting. Dogwood, azaleas, and *Viburnum tomentosum,* the last very heavily flowered, added to the charm of this place on Cleveland Lane.

Two splendid specimens of *Viburnum Sieboldi* stand at each side of the main entrance to the residence of Mr. and Mrs. Bernard Peyton. The planting near the house and the lovely walled garden were designed by the late Marian Coffin, landscape architect. The pink and yellow tulips, in flower at the time of the tour, yield place to irises and daylilies as the season advances.

Beyond is a circular garden bordered with box. A wide perennial border in which are featured iris, phlox, daylilies, plantain lilies, and Oriental poppies—each planted in large enough groups to create an effective mass display when in flower—leads to the azalea gardens and plantings of native trees and shrubs. Among the latter were some fine specimens of *Viburnum prunifolium.*

The home of Mr. and Mrs. David H. McAlpin, designed by Aymar Embury, fits harmoniously into its beautiful natural setting on a steep slope above Stoney Brook. The more formal gardens—a circular rose garden, a perennial garden, and an early spring garden—adjacent to the house and terrace are a pleasing contrast to the extensive woodland below the house. Along the paths leading to the brook are native trees, shrubs, flowers, and ferns. This woodland is delightful in spring and a haven for many kinds of birds.

Israel Grows Gladiolus Bulbs for Export. Near Beersheeba, the capital of the Negev, is one of Israel's richest bulb-producing areas. There intensively cultivated farms—all of them irrigated — have mushroomed in the past few years because of the great influx of immigrants. Take, for example, Ze'ev Shimshoni who arrived in the Holy Land seven years ago from Bulgaria, where he had been employed as a factory worker. Now he has a five-acre farm complete with barn, chicken run, vegetable plot, young orchard, and what he describes as his proudest achievement, flower beds.

Mr. Shimshoni wrote, "I learned quickly

Gladiolus are picked for the local market in Huleh Valley, Israel. Buildings of Huleh Authority are in the background.

These gladiolus bulbs are raised in Huleh Valley, once a swamp, for export.

that Israel is a flower-conscious country. Nearly everyone grows flowers — even in window boxes in the cities—and many people either exhibit at or take some interest in the flower shows and competitions held regularly during the year. Flowers have a tremendously important place in the festivals. In a manner of speaking, flowers in Israel are a natural resource. ."

His is one of the many farms on which gladiolus bulbs are being grown for export. He is proud of the fact that he gets a sixty per cent yield of No. 1 bulbs (one and a half to two inches) from No. 5 and No. 6 bulbs (one quarter to one half of an inch), while in Holland No. 5 and No. 6 bulbs yield none at all.

Through a combination of suitable soil and climate, the rolling southern region of Israel is superbly fitted for growing seeds and bulbs, especially gladiolus bulbs, according to a report from Anthony Nyssen, Sr., a Holland bulb grower, who visited the Holy Land. He also made note of the fact that the growers in Israel get three crops of bulbs annually to his one.

Mr. Nyssen and other bulb experts "made the rounds" of Israel—they visited the different parts of the country where bulbs are being produced commercially. They spent some time in "Galilee where the hills, with their rainbow of wild flowers, contrast with the cultivated flowers of farms and villages." They traveled in the Jordan Valley and in the famous Sharon Valley, which impressed them with its "unbelievably rich soil."

The fact that gladiolus bulbs can be had from Israel in September for immediate planting is important to growers in the southern and southwestern areas of the United States. At present, the bulbs available to them at that particular time of the year are either green (improperly cured) or non-virgin (taken from stems after flowers have been cut). Such bulbs are not likely to produce good results.

The Holly Society of America at its meeting in Philadelphia, April 22, 1960, announced the names of new forms of hollies that had been registered by its Registration Committee:

Ilex cornuta 'Floralia' (Henderson, Aiken, South Carolina). A twelve-year-old berried seedling of *I. cornuta* believed to have been pollinated by an unnamed *I. opaca*. It has the habit and gray bark of the American holly. Recommended for landscape use.

Ilex opaca 'Pin Cushion' (Wyckoff, Bedminster, New Jersey). Only twenty-eight inches tall and spreading forty-two inches in fifteen years, this seedling is recommended for landscape plantings. It is a pistillate form with carmine berries. The slightly glossy leaves are retained during the second growing season. The original plant is growing on heavy soil.

Ilex vomitoria 'Otis Miley' (Galle, Pine Mountain, Georgia). A yellow-berried form of yaupon found in 1956 on the Miley farm six miles west of Bogalusa, Washington Parish, Louisiana. (The original plant is now growing in the Ida Cason Calloway Gardens, Georgia.) This form, which holds its foliage during two growing seasons, is recommended for landscape use, especially as a hedge.

Ilex crenata convexa 'Green Pygmy' (Shammarello, South Euclid, Ohio). The original plant was raised as a berry-bearing seedling of the convex-leaved Japanese holly at the Shammarello Nursery in 1952. A uniform grower, it is developing into a compact dwarf form recommended for hedges. The slightly glossy cup-shaped leaves have much character, and some of them are retained for the second growing season. (Plant patent applied for.)

Ilex crenata convexa 'Mentor Glossy' (Shammarello, South Euclid, Ohio). Staminate seedling of the convex-leaved Japanese holly raised in 1945 at the Shammarello Nursery. Its glossy dark green foliage, slightly larger than the parent type, and its informal bushy habit make it a landscape plant.

Ilex opaca 'Prince Ed' (Wyckoff, Bedminster, New Jersey). Floriferous staminate American holly blooming in three years from cuttings. The original plant stands eight feet tall and spreads five feet. A good growing, glossy-leaved holly recommended as a foliage specimen. (Name applied by Henry Hohman, Kingsville, Maryland.)

The Garden Club of America, at its annual meeting held in Palm Beach, Florida, in April 1960, presented its Founder's Fund Award to the Sand Hills Garden Club of Augusta, Georgia, for the beautification of the Old Medical College grounds. The Garden Club of America also presented the following medals: Medal of Honor to Dr. S. L. Emsweller, Chief of the Ornamental Research Branch, U. S. D. A., Beltsville, Maryland; Francis K. Hutchinson Medal to John H. Storer, Winter Park, Florida; Margaret Douglas Medal to Mrs. Avery Rockefeller, Greenwich, Connecticut; Florens DeBevoise Medal to Mrs. J. Norman Henry, Gladwyn, Pennsylvania; Eloise Payne Luquer Medal to Miss Caroline Dormon, Saline, Louisiana; Amy Angell Collier Montague Medal to Mrs. Stephen C. Clark, Cooperstown, New York; and Mrs. Oakleigh Thorne Medal to Amelia Peabody, sculptor, of Boston.

"The Symbol of the Rose in Textile Design," the exhibit which opened on April 20, will continue through mid-July 1960 at the Scalamandré Museum of Textiles in New York City. The exhibit is based solely on textiles in which the rose is featured.

On display is a gold lamè woven with metallic yarn in which is depicted a Renaissance rose—of the type that could have been used when Henry VIII and Francis I met in France on the "Field of the Cloth of Gold" during the sixteenth century. There is a reproduction of a wood-block print with the Tudor rose that dates back to the Elizabethan period; and the Queen Anne period is represented with linens brocaded with woolen roses.

A Victorian rose fabric.

Contemporary rose design on all-silk lampas.

Other fabrics run from the French Baroque period of Louis XIV featuring large-scaled roses, the elegant Rococo fabrics of the Louis XV period, the intricately patterned lampases by Philippe de la Salle, the notable designer of the eighteenth century, to the modern rose motifs in today's textiles.

The August 1950 issue of the *Journal of The New York Botanical Garden* carried an article, "The Rose as a Motif in the Decorative Arts," by John Kent Tilton, Director of the Scalamandré Museum.

"The Duchess at the Hunt" and "The Departure of Sancho for the Island of Barataria," after paintings by Charles Coypel, framed at each side; in the central medallion Dox Quixote on his horse Rossinante. Designs for the garlands and framing were by the painter Lovinfosse. This tapestry was part of a present from Napoleon I to the Prince of Hesse-Darmstadt in 1810.

Below. Flemish "mille fleurs" tapestry from the collection of Kaiser Wilhelm and a simulation of the tapestry in living flowers.

"Flowers in Art" was the title of another exhibit—at the galleries of French and Company in New York City in April 1960—when tapestries, furniture, paintings, mirrors, candelabras, and objets d'art, all employing floral themes, were shown for the benefit of the New York City Beautification Program sponsored by the Fifth Avenue Association. Arrangements of spring flowers dramatized the exhibit.

One of the highlights of the show, which covered four centuries of flowers in art, was a five by twenty-foot, sixteenth-century Flemish "mille fleurs" tapestry. In this tapestry from the collection of the late Kaiser Wilhelm in Potsdam Palace, three wreaths enclose landscape medallions against which appear the coats of arms of the family for whom the tapestry was woven. Simulating the floral design in actual flowers involved more than a demanding design task. Some of the flowers depicted in the tapestry are no longer available, and furthermore weavers in the sixteenth century often did not work from real flowers but created their own versions. The floral artists, under the direction of William Rutherford, landscape architect, and Everett Conklin did remarkably well in their reproductions.

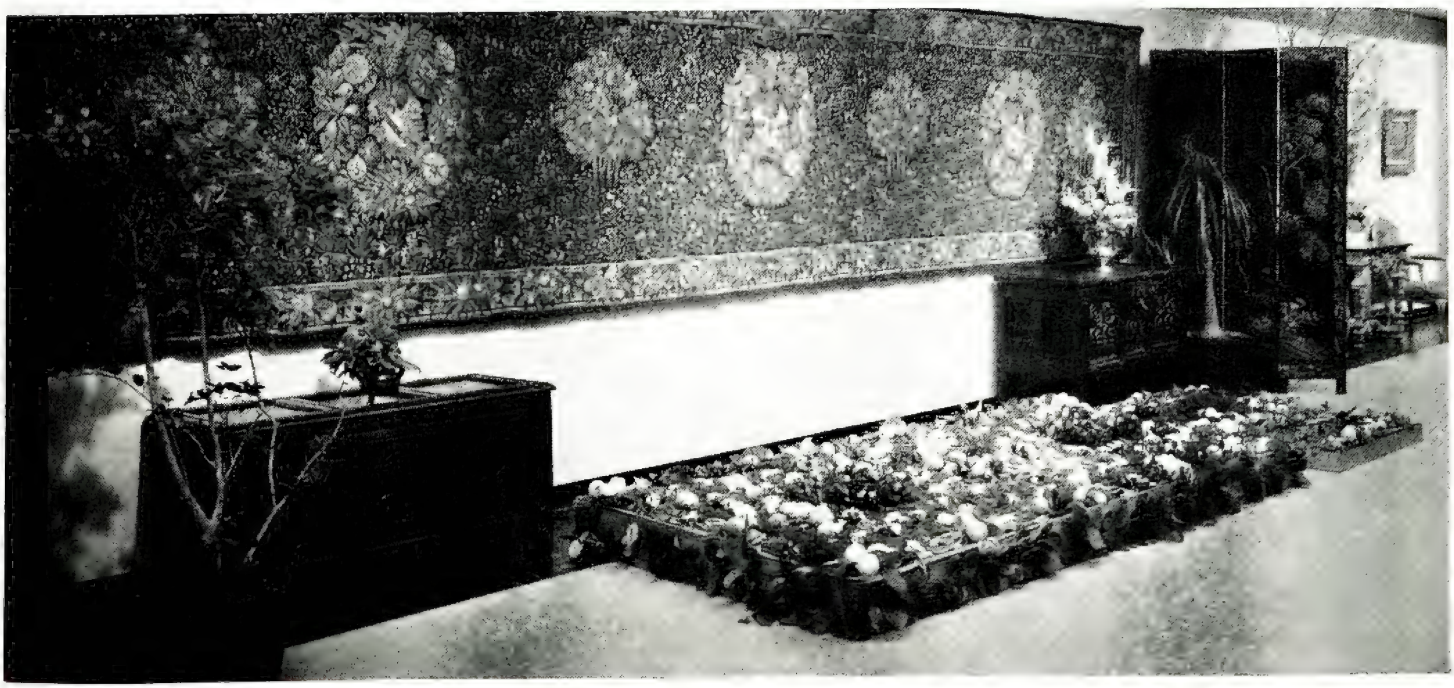
Robert Tyler Davis, museum consultant of French and Company, was the designer of the exhibit, "Flowers in Art."

Dr. Paul B. Sears, botanist and conservationist, retired from the faculty of Yale University on June 30, 1960. Dr. Sears went to Yale ten years ago to establish the first graduate program in research and instruction in the conservation of the country's natural resources.

Dr. William H. Martin has retired as Dean of the College of Agriculture, Rutgers University, after serving the University for forty-five years. Special events were held in May to pay tribute to his many accomplishments.

Dr. Josiah L. Lowe, research professor of forest botany at the College of Forestry, Syracuse University, is spending five months in Great Britain, under a National Science Foundation grant, to continue his study of fungi which cause rot in wood. Dr. Lowe is recognized as an authority on the genus *Poria,* a very important group of wood-decay fungi.

(Continued on page 164)



NOTES ON BOOKS (from page 153)

State Garden Clubs. Her interpretation and adaptation of Japanese methods of flower arrangement are very practical.

RELIGIOUS THEMES IN FLOWER ARRANGEMENT. Ruth E. Mullins. 122 pages, illustrated, part colored, indexed. Hearthside Press, New York. 1959. $5.95.

Of special interest are the symbolism plant lists.

STEPPING STONES TO JAPANESE FLORAL ART. Rachel E. Carr. 6th rev. ed. 115 pages, illustrated, part colored. David McKay Co., New York. 1959. $4.95

The author studied under Japanese masters of floral art for a number of years. Her diagrams, photographs, and text are clear and understandable.

THE HOME BOOK OF FLOWER ARRANGEMENTS USING ORIENTAL, EUROPEAN, AND COLONIAL CONTAINERS. Estelle G. Easterby. 156 pages indexed, illustrated, part colored. Chilton Co., Philadelphia. 1960. $3.50.

Mrs. Easterby has lectured and judged in many of the southern states.

THE DRIFTWOOD BOOK. Mary E. Thompson. 200 pages, illustrated. D. Van Nostrand Co., Princeton, N. J. 1960. $5.95

Mrs. Thompson's basic text and excellent arrangements are set off by Mr. Skirsky's exquisite photographs.

THE ROCKWELL'S NEW BOOK OF FLOWER ARRANGEMENT. F. F. Rockwell and Esther C. Grayson. 336 pages, indexed, illustrated, part colored. Doubleday & Co., New York. 1960. $5.95

New, practical, comprehensive—a really complete encyclopedia of floral art.

WOODFORMS AND DRY MATERIAL. Naida Gilmore Hayes. 47 pages, illustrated. Hayes Studio, Berkeley, Cal. 1960. $1.00

43 photographs with descriptive captions.

ECONOMIC PLANTS

DIRECTORY OF THE HISTORIC CABINET WOODS. Lewis F. Hinckley. 186 pages, indexed, illustrated. Crown Publishers, New York. 1960. $5.95

The botanically curious connoisseur of antique furniture will revel in this excellent work.

PLANTS THAT CHANGED THE WORLD. Bertha S. Dodge. 183 pages, indexed, illustrated. Little Brown & Co., Boston. 1959. $3.50

History making plants such as breadfruit, cocoa, rubber, quinine. Young readers should find this book entertaining as well as educational.

THE GRASSES; EARTH'S GREEN WEALTH. Alma Chesnut Moore. 150 pages, indexed, illustrated. Macmillan Co., New York. 1960. $5.00

Written chiefly for the layman in a delightfully readable style. Deals with those grasses which form man's main starchy foods—wheat, barley, sugar cane, oats, bamboo, rye, corn, rice, sorghum, millet.

USING WAYSIDE PLANTS. Nelson Coon. 3rd rev. ed. 254 pages, indexed, illustrated. Hearthside Press, New York. 1960. $3.95

Limited to 100 plants found in northeastern United States. For the nature counselor this is the ideal book, as it abounds in edible plants, dye plants, medicinal plants, plant crafts, and so on.

CONSERVATION, NATURAL HISTORY, AND MISCELLANEOUS WRITINGS

A BOOK ABOUT BEES. Edwin Way Teale, 208 pages, indexed, illustrated. Indiana University Press, Bloomington, Ind. 1959. $1.95

Eighty-five photographs by the author, originally published as *The Golden Throng.*

ADVENTURE IN NATURE. Edwin Way Teale. 304 pages, illustrated. Dodd, Mead Co., New York. 1959. $4.00.

A selection of writings from the author's earlier works, some of which are now out-of-print.

AMERICA'S WONDERLANDS; THE SCENIC NATIONAL PARKS AND MONUMENTS OF THE UNITED STATES. National Geographic Society. 512 pages, illustrated, part colored. National Geographic Society. Washington, D. C. 1959. $11.50

Superb production of text and pictures under the editorship of Merle Severy, Chief of the National Geographic Book Service.

EVERGLADES—THE PARK STORY. William B. Robertson, Jr. 88 pages, illustrated. University of Miami Press, Coral Gables, Fla. 1959. $1.00

Generously illustrated account of the landscape, mammals, birds, fish, invertebrates, plants, and Indians of Everglades National Park.

FIND A CAREER IN CONSERVATION. Jean Smith. 160 pages, indexed, illustrated. G. P. Putnam's Sons, New York. 1959. $2.75

An up-to-date mine of information for the young person. Here are discussed the advantages, disadvantages, and requirements of experience and education, and useful are the lists of organizations which offer assistance.

HOW TO GO LIVE IN THE WOODS ON $10 A WEEK. Bradford Angier. 269 pages, illustrated. Stackpole Co., Harrisburg, Pa. 1959. $5.00

"Where is that going to be?" writes this author. "Alaska, Yukon Territory, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, and Quebec." An amazing assembly of facts, figures, and suggestions for a rugged existence.

INTRODUCTION TO THE NATURAL HISTORY OF THE SAN FRANCISCO BAY REGION. Arthur C. Smith. 72 pages, illustrated, part colored. University of California Press, Berkeley, Cal. 1959. $1.50

Useful features of this compact pocket-size booklet are the list of field trips and the biotic communities tabulation.

MEDITATIONS ON GARDEN THEMES. Josephine Robertson. 112 pages. Abingdon Press, Nashville, Tenn. 1959. $1.75

A collection of the author's reminiscences of garden chats and visits here and abroad.

NATIONAL PARKS IN CALIFORNIA. Dorr Yeager. 96 pages, illustrated. Lane Publishing Co., Menlo Park, Cal. 1959. $1.95

Well-illustrated accounts of the four national parks of California—Yosemite, Lassen Volcanic, Sequoia, and Kings Canyon.

101 AMERICAN WILD FLOWERS. Jewell Casey. 101 pages, indexed, illustrated. Vantage Press, New York. 1959. $3.00

Flowers native to Texas predominate in this little book which contains much interesting plant and folk lore.

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OUTDOOR REFERENCE GUIDE. Amelia Reynolds Long, comp. 288 pages, illustrated. Stackpole Co., Harrisburg, Pa. 1959. $7.50

A dictionary for the outdoorsman, containing definitions and descriptions of plants, animals, fishing, hunting, and boating.

THE HIGHWAY AND THE LANDSCAPE. W. Brewster Snow, ed. 230 pages, indexed, illustrated. Rutgers University Press, New Brunswick, N. J. 1959. $5.00.

Twelve nationally known authorities are contributors to this volume. Especially useful are the chapters entitled "The Functional Uses of Plants on the Complete Highway" and "Suggested Plant Materials Lists" by Dr. Richard P. White.

THE NATURAL THING; THE LAND AND ITS CITIZENS. Pieter W. Fosburgh. 225 pages. Macmillan Co., New York. 1959. $4.75

A selection of delightful essays by a former editor of *The Conservationist*, the official publication of the New York State Conservation Department.

THE WORLD'S HAPPIEST GARDENERS. J. I. Rodale, ed. 128 pages, illustrated. Rodale Books Inc., Emmaus, Pa. 1959. $1.00

A collection of short articles written by ardent followers of organic gardening.

THIS LAND OF OURS; COMMUNITY AND CONSERVATION PROJECTS FOR CITIZENS. Alice Harvey Hubbard. 272 pages, indexed. Macmillan Co., New York. 1960. $4.95

The former conservation chairman of the 9th District of the Federated Garden Clubs of New York State, Inc., presents a wealth of information including lists of reservations, sanctuaries, community gardens, and forests.

THOUSAND ACRE MARSH. Dudley Cammett Lunt. 174 pages, illustrated. Macmillan Co., New York. 1959. $3.75

Nature writing at its best—spring and winter in the marshes of Delaware, summer in the state of Maine.

WILDLIFE CONSERVATION. Ira N. Gabrielson. 2nd ed. 244 pages, indexed, illustrated. Macmillan Co., New York. 1959. $5.50

This edition includes a new chapter on the effect that changing practices in farming have had on our quickly disappearing wildlife.

WILDLIFE IN DANGER. Ivah Green. 128 pages, illustrated. Coward-McCann Inc., New York. 1960. $3.50

Fascinating text and excellent photographs of our extinct and nearly extinct birds and mammals, with an ardent plea to preserve those that are still with us.

CHILDREN'S BOOKS

A MAXTON BOOK ABOUT BEES AND WASPS. Valerie Swenson. 27 pages, illustrated, part colored. Maxton Publishers, Inc., New York. 1959. $.69.

Two-thirds of this fascinating little book are devoted to the honey-bee. However, the hornet, wasp, yellow jacket, and bumblebee are described and enchantingly illustrated in color.

A MAXTON BOOK ABOUT LIFE UNDER THE MICROSCOPE. William M. Hutchinson and Kathleen Henderson. 27 pages, illustrated, part colored. Maxton Publishers, Inc., New York. 1959. $.69.

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The illustrations are based on models in the gallery of the Hall of Ocean Life and various other exhibits in the American Museum of Natural History. For the young beginner.

THE ADVENTURE BOOK OF GROWING PLANTS. Frances M. Miner. 95 pages, indexed, illustrated. Capitol Publishing Co., Inc., New York. 1959. $3.95

Miss Miner is known to hundreds of children and teachers who have attended her gardening classes at the Brooklyn Botanic Garden. Her book is based on years of experience in children's garden work.

ALL ABOUT THE ICE AGE. Patricia Lauber. 153 pages, indexed, illustrated. Random House, New York. 1959. $1.95

No. 31 in the "Allabout Books" series. Many grown-ups could read this book with interest.

ALL ABOUT THE JUNGLE. Armstrong Sperry. 142 pages, indexed, illustrated. Random House, New York. 1959. $1.95

Plants, animals, and men of the jungles of both hemispheres.

BEFORE AND AFTER DINOSAURS. Lois and Louis Darling. 95 pages, illustrated. William Morrow & Co., New York. 1959. $2.95

The illustrations by the authors make this fascinating for all ages from nine to ninety-nine.

CLIFF DWELLERS OF WALNUT CANYONS. Carroll Lane Fenton and Alice Epstein. 64 pages, illustrated. John Day Co., Inc., New York. 1960. $2.75

About Arizona cliff dwellers of eight hundred years ago—the wild plants that they gathered, the houses that they built of stone and clay, and much more. Written in rhythmic prose, this book is well suited to being read aloud.

HOW TO GROW HOUSE PLANTS. Millicent E. Selsam. 96 pages, illustrated. William Morrow & Co., Inc., New York. 1960. $2.50

Mrs. Selsam has almost a dozen titles to her credit. Her *Play with Plants, Play with Seeds, Play with Trees* are favorites in the children's book corner of the Library of The New York Botanical Garden.

OUR WORLD OF SCIENCE. Duane Bradley and Eugene Lord. 159 pages, indexed, illustrated. J. B. Lippincott Co., Philadelphia. 1959. $3.00

Young readers will find directions for performing experiments such as "floating steel on water," "making inks for writing secrets," and so forth.

PLANTS THAT HEAL. Millicent E. Selsam. 96 pages, indexed, illustrated. William Morrow & Co., Inc., New York. 1959. $2.50

From the herbs of the medicine man to the twentieth-century stories of penicillin and *Rauwolfia*.

SOON AFTER SEPTEMBER; THE STORY OF LIVING THINGS IN WINTER. Glenn O. Blough, and Jeanne Bendick. 48 pages, illustrated. McGraw-Hill Book Co., New York. 1959. $2.50

This tells the very young reader some of the things that happen, just before winter sets in, to plants and animals.

THE FIRST BOOK OF NATIONAL MONUMENTS. Norman Lobsenz. 90 pages, indexed, illustrated. Franklin Watts Inc., New York, 1959. $1.95

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THE FIRST BOOK OF NATIONAL PARKS. Norman Lobsenz. 88 pages, indexed, illustrated. Franklin Watts Inc., New York. 1959. $1.95.
Another of these really thrilling "first books."

THE FIRST BOOK OF WATER. F. C. Smith. 69 pages, indexed, illustrated. Franklin Watts Inc., New York. 1959. $1.95
Water for power, water for fun, water, water everywhere. A thrilling little book that teaches conservation well.

THE TALE OF A MEADOW. Henry B. Kane, 119 pages, indexed, illustrated. Alfred A. Knopf, 1959. $3.00
Plants and animals of a meadow in New England, illustrated by the author with photographs and line drawings.

UNDER A GREEN ROOF; ANIMALS AND BIRDS OF OUR WOODS. Anne Marie Jauss. 64 pages, illustrated. J. B. Lippincott Co., Philadelphia. 1960. $2.95
Delightful glimpses of the animal inhabitants of eastern United States, the Southwest, the wooded mountains of the Pacific Coast, Alaska, and Puerto Rico.

WHO LIVES IN A FIELD. Duryea Morton. 127 pages, illustrated. Coward-McCann Inc., New York. 1959. $3.00
The habits and adventures of the woodchuck, the white-footed mouse, the cottontail rabbit, and many more of their neighbors. The illustrations by Douglas Howland are exceptionally lovely.

WONDERS OF THE ARCTIC. Jacquelyn Berrill. 95 pages, indexed, illustrated. Dodd, Mead & Co., New York. 1959. $2.95.
Companion book to *Wonders of the Antarctic.* Well-written accounts of the Arctic animals with a chapter on Arctic explorers.

YOUR CHILD IN A SCIENTIFIC WORLD. Albertina A. Weinlander. 192 pages. Doubleday and Co., New York. 1959. $2.95
For parents, teachers, nature counselors, and all those dedicated persons interested in science education for children. Has directories of scientific supply houses, scientific organizations, lists of projects, experiments, etc., and a comprehensive bibliography.

NOTES (from page 161)

The results of Dr. Lowe's study abroad will be published as part of a classification manual of fungi in North America. He has been working on the manual for the past fifteen years and expects to complete it in 1966 or 1967.

Dr. Ivan M. Johnston, Associate Professor of Botany at Harvard University, died at the age of sixty-two on June 1, 1960. Dr. Johnston, an authority on the flowering plants of North and South America, had taught and engaged in research at Harvard for almost forty years. He was an assistant in the Gray Herbarium from 1922-1931, a research associate at the Arnold Arboretum from 1931-1938, its associate director from 1948-1953, and at the time of his death a member of its professional staff.

Visitors to The New York Botanical Garden within recent months have included:
Dr. Henry A. Gleason, Head Curator Emeritus, Dr. Gleason spent several days at the Garden on his way from Florida to New Hampshire, where he will spend the summer.
Dr. James Whitehead, Director, Museum of Arts and Sciences, Staten Island.
Dr. and Mrs. Roger McVaugh, University of Michigan, Ann Arbor, Mich.
Dr. Robert T. Clausen, Cornell University, Ithaca, N. Y.
Dr. Edgar T. Wherry, Philadelphia, Pa.
Dr. and Mrs. John C. Wister, Arthur Hoyt Scott Horticultural Foundation, Swarthmore, Pa.
Dr. and Mrs. Otto Degener, Mokuleia Beach, Oahu, Hawaii.
Mrs. F. H. Affleta, Brookline, Mass.
Frederic T. Steele, Littleton, N. H.
Dr. Richard A. Howard, Director, Arnold Arboretum, Cambridge, Mass.
Dr. Burdette E. Wagenknecht, Arnold Arboretum, Cambridge, Mass.
Dr. Clarence E. Kobuski, Arnold Arboretum, Cambridge, Mass.
Dr. John C. Wright, Montana State College, Bozeman, Mont.
Dr. G. Staudt, Max Planko Institute, Germany.
Mrs. Roxana S. Ferris, Stanford University, Stanford, Cal.
Dr. Ralph C. Benedict, Brooklyn, N. Y.
Dr. S. K. Dutta, Calcutta, India.
Dr. George Emery, Brookhaven National Laboratories, Upton, Long Island.
Dr. Seymour Shapiro, Brookhaven National Laboratories, Upton, Long Island.
Dr. James Brewbaker, Brookhaven National Laboratories, Upton, Long Island.
Dr. Francis Drouet, Dept. of Botany, University of Arizona.
Dr. George Taylor, Director, Royal Botanic Gardens, Kew, Surrey, England.
Dr. Ivan M. Johnston, Dept. of Botany, Harvard University, Cambridge, Mass.
Dr. Jose Cuatrecasas, U. S. National Museum, Smithsonian Institute, Washington, D. C.
Mr. and Mrs. Ambrose Brownell, Milwaukie, Ore.
Everitt Miller, Horticulturist, Longwood Gardens, Kennett Square, Pa.
Dr. and Mrs. John Pelton, Butler University, Indianapolis, Ind.
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Dr. Theodore Kazimiroff, Bronx, New York City.
H. Gordon Howe, Research Corp., New York City.
Dr. K. S. Thind, Amsibar, India.
Dr. P. D. Peterson, Dobbs Ferry, New York.
Dr. D. P. Satchell, Agrico Co., Westfield, N. J.
Noah Edwards, Agrico Co., Westfield, N. J.
Dr. Harold Clum, Dept. of Botany, Hunter College, New York City.
Dr. Moritz Jagendorf, New York City.
Dr. Isabel Taveres, University of California, Berkeley, Cal.
Dr. John J. Wurdack, U. S. National Herbarium, Smithsonian Institute, Washington, D. C.
Dr. and Mrs. E. K. Boom, Institute of Plant Breeding, Wageningen, Holland.
Dr. Milton Thiagode Mello, Institute Oswaldo Cruz, Rio de Janeiro, Argentine.

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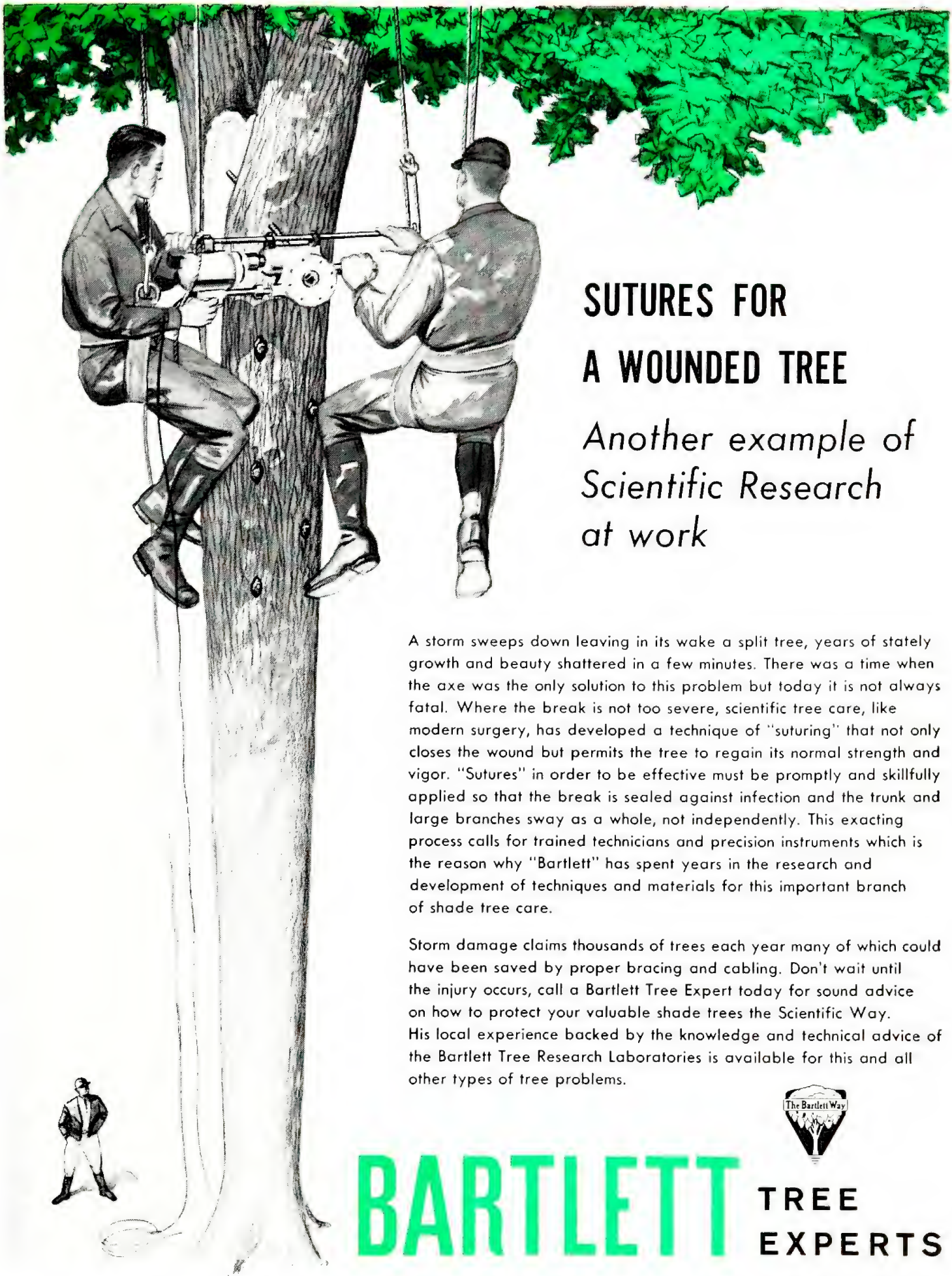

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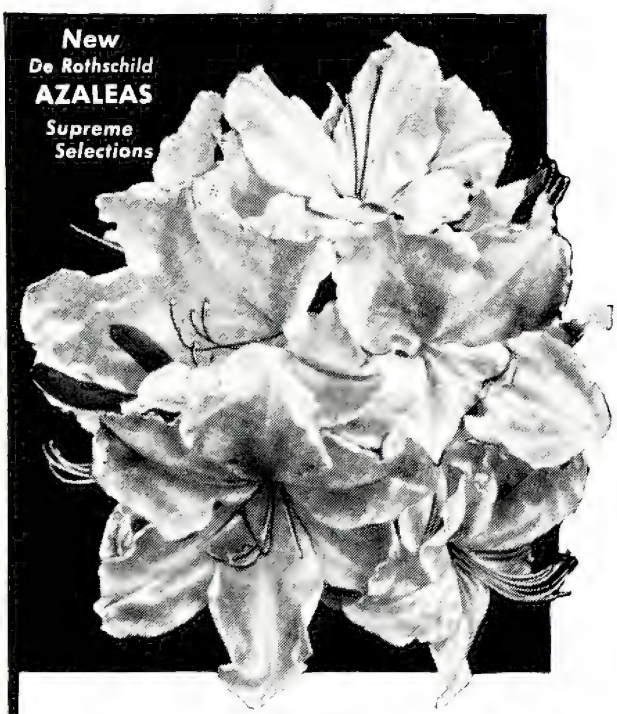

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New ABELIOPHYLLUM, *Distichum,* called white forsythia, is a most beautiful conversation plant. Palest pink when buds open, this 3½ foot, sun-worshiping shrub soon turns into the most welcome snow-white Spring flower-drift you've ever seen.

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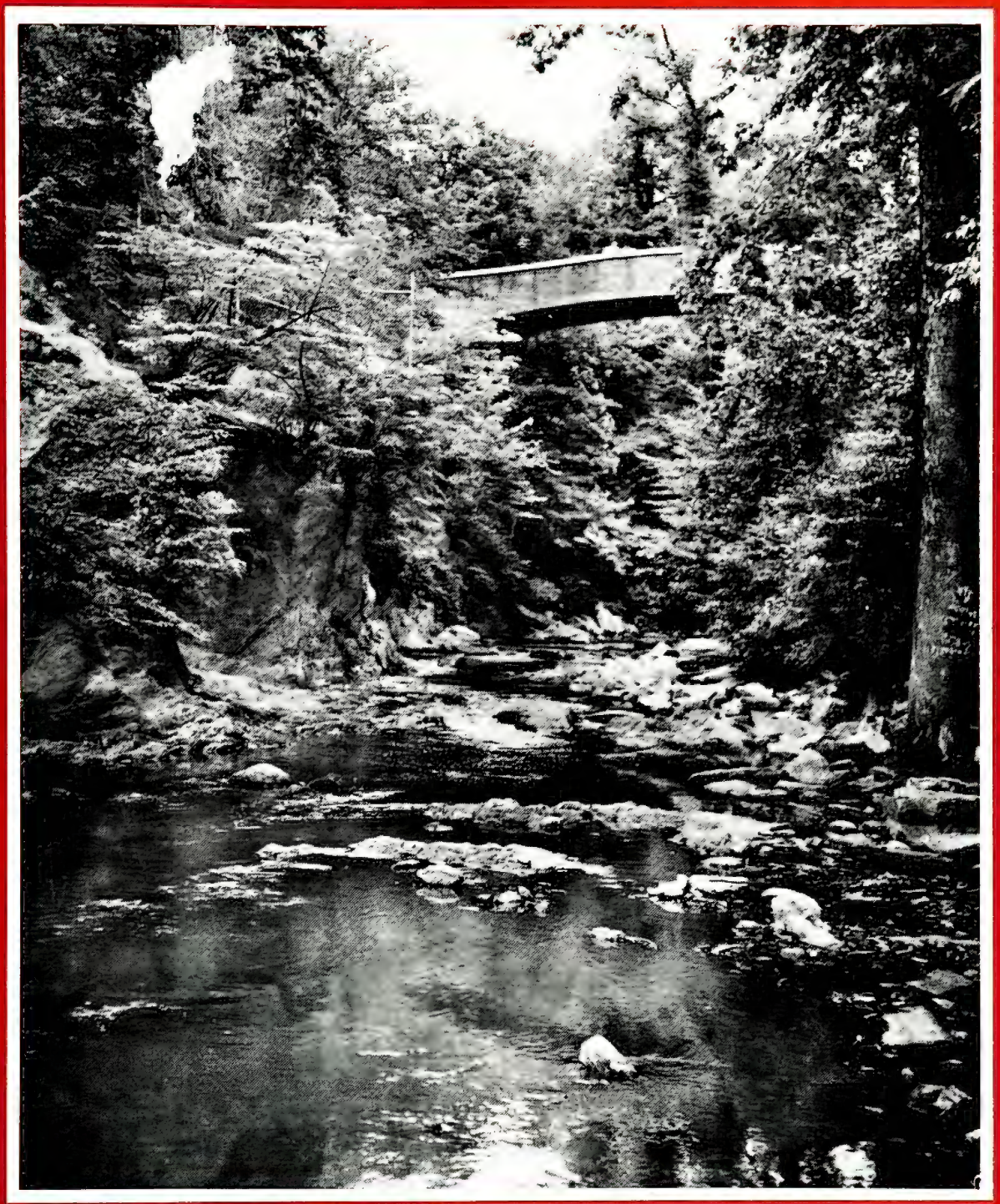

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 5 September - October, 1960

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

September 18-23, 1960. Fortieth Annual National Conference on State Parks, Samoset Hotel, Rockland, Maine.

September 19-21, 1960. National Council of State Garden Clubs, Central Atlantic Regional Meeting, Statler Hilton Hotel, Buffalo, New York.

September 21-22, 1960. Annual Show of American Dahlia Society and Dahlia Society of New Jersey, Garden State Plaza, Paramus, New Jersey.

September 24, 1960. Sixth Annual Flower Show of North Jersey Rose Society, Colonial Life Insurance Building, East Orange, New Jersey.

October 7-9, 1960. Second Mid-American Orchid Congress and Show, with Illinois Orchid Society as host. Congress at Sherman Hotel, Chicago; Show at Chicago Federal Savings and Loan Association.

October 15-23, 1960. Flower Show of Ninth District, Federated Garden Clubs of New York State, Inc., in conjunction with Home and Garden Show, County Center, White Plains, New York.

October 18, 1960. Open Garden Day at The New York Botanical Garden.

November 4, 1960, 1 p.m. Chrysanthemum Show in Conservatory of The New York Botanical Garden opens to members of the Garden.

November 5, 1960, 10 a.m. Chrysanthemum Show in Conservatory opens to the public.

November 10-12, 1960. Fifteenth American Horticultural Congress with headquarters at Huntington Sheraton Hotel, Pasadena, California.

November 15, 1960. Open Garden Day at The New York Botanical Garden.

December 8, 1960. Annual Holiday House Tour sponsored by the Volunteer Associates of The New York Botanical Garden.

January 5, 12, 19, 26, 1961, 11 a.m. Downtown Lecture Series sponsored by the Volunteer Associates of The New York Botanical Garden. Mrs. John Fiske and Mrs. Marcus Fair, Co-Chairmen of the Committee on Arrangement.

January 9, 1961. Theatre Benefit sponsored by the Volunteer Associates of The New York Botanical Garden; "Critic's Choice," with Henry Fonda, at the Barrymore Theatre. Mrs. Marshall F. Dancy and Mrs. Oliver A. Vietor, Co-Chairmen of the Committee on Arrangements.

March 4-12, 1961. International Flower Show, The Coliseum, New York, N. Y.

April 28-May 7, 1961. International Flower Show in Valentino Park, Torino, Italy. For information: Dr. Guido Nani, Secretary, Piedmont Horticultural Society, Lungo Dora Firenze, 119, Torino, Italy.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, and Mrs. Donald B. Straus, for the selection of the front cover illustration—the footbridge over the Bronx River in The New York Botanical Garden, photo by E. N. Mitchell; pp. 167-170, Brookhaven National Laboratory, Upton, L. I.; pp. 173-177, Andre Viette; pp. 178-180, The Davey Tree Expert Co., Kent, O.; pp. 182-185, TVA Division of Forestry Relations, Clinton, Tenn.; p. 200, E. N. Mitchell; p. 201, Gottscho-Schleisner; p. 202, Dr. Richard M. Klein; p. 186, **Chelone glabra**; p. 187, **Erythronium americanum**; p. 188, **Pyrola elliptica**; p. 189, **Scilla hispanica (S. campanulata)**, crocus, **Galanthus nivalis, Scilla sibirica,** tulip, and **Narcissus poeticus**; p. 192, hepatica by Charles C. Clare, Jr.; special insert, T. H. Everett.

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MOLECULES IN THE LIFE OF A PLANT

By George L. McNew

Dr. McNew is Managing Director of the Boyce Thompson Institute for Plant Research, Inc., Yonkers, New York. He delivered the following talk at the graduation exercises for the Two-year Courses in Practical Gardening and Botany at The New York Botanical Garden on June 21, 1960.

THE SCIENCE of botany and the arts of horticulture are undergoing revolutionary changes which were undreamed of three decades ago. The old concepts about the relationship of species and cultivars as morphological units have served as the foundation of a new science. Man has come to consider plants as so much plastic material which can be molded and shaped to suit his purposes.

The behavior of plants as living things has become increasingly important as he has sought to increase their efficiency and usefulness. It is well known that they do not have a central nervous system. However, the parts are so coordinated that the entire organism functions most beautifully as an integrated unit. Because of this, man has long been prone to ascribe purpose to the behavior of plants, as though action arose from mental design.

However, the answer to plant behavior must be sought elsewhere. Why do plants follow such rigid rules of conduct that one can predict their response to changes in environment, competition with other species, and reaction to a multitude of commensal and antagonistic microorganisms? What are the latent possibilities of every living cell in the plant regardless of whether it is especially differentiated for lateral or terminal growth, reproduction, synthesis of food, nutrient and water procurement, or protection and re-enforcement of delicate tissues?

The answers to these questions lead one to the study of chemicals in the living cell. The coordination of cell functions and differentiation into tissues for special uses trace down to the behavior of the chemical compounds in the cells. There are thousands upon thousands of these compounds operating in a world of free enterprise and governed by basic laws. It is the duty of the trained botanist and horticulturist to ferret out and understand these basic laws or principles because through them, and them alone, will man make full use of plants in satisfying his material and esthetic needs.

In the life of any plant there are thousands of molecules. Some of these molecules serve in growth and reproduction, others in disease-induction and resistance to pests, still others regulate the hereditary processes. To this native complement of complex organic systems must be added the foreign molecules that have been conceived and designed by man to enter into the living cell in order to destroy or to retard the normal functions, or subvert them into channels he considers desirable.

Without pretense of being systematic or exhaustive, I should like to discuss some of the recent developments in plant chemistry. A few examples may serve to illustrate how our concepts are growing and the potential usefulness of these concepts. Perhaps the graduates whom we have come here to honor will find in these activities of plants another dimension for their respect and appreciation of plant life.

The Dynamic Processes of the Cell in Photosynthesis

The greatest factory on the face of the earth is located in the foliage of plants. In terms of energy transfer or chemical synthesis, the process of photosynthesis completely dwarfs man's best achievements. As a phenomenon for fixing energy in usable form it is unique among the processes upon which he has come to rely. It is an unusual endothermic reaction in that it proceeds so easily to completion without requiring special conditions of temperature and pressure.

The chemical processes are rapidly being elucidated. Something of the magnitude of the processes involved in combining carbon dioxide and water can be visualized from investigations on $C^{14}O_2$, in photosynthesis. Within three minutes after plants are exposed to $C^{14}O_2$, some fifty-seven new compounds may be found bearing the labeled carbon atom. This dynamic process could not be duplicated by a chemist or even a staff of chemists in less than several weeks or months of careful synthesis.

Starting with very simple raw materials and radiant energy, the energy is fixed in readily digestible carbohydrates and amino acids. These can be stored until needed. The world of man's affairs awaits the duplication of this feat so that energy can be stored during daylight until it is needed at night. The use of cell-free extracts to implement this reaction looms more and more important as we proceed into the space age. Untold benefits could accrue in space travel if energy such as is being employed in solar batteries of space vehicles, or the man-made satellites of today, could be used to operate a photosynthetic process. This would permit the purification of the restricted spaces that may be occupied by a space traveler of carbon dioxide, the restoration of free oxygen for respiratory processes, and production of supplementary food. Once the secret is unraveled, man will be one step closer to controlling his environment and to escaping from its present confines.

The Environmental Effect on Plant Buds

The great seasonal cycle of development in plants is closely attuned to changes in weather. The buds of a tree remain dormant until the proper season, flower buds are not initiated haphazardly, and many other processes are attuned to seasonal development.

Many flowering plants set blossoms at specified seasons of the year. This is usually found to be dependent upon the length of day or a combination of day-length and temperature effects. Some plants can initiate the development of flower buds only when exposed to short days, while others require long daylight (ten to fourteen hours) and short dark periods. The photoperiod response restricts the use of plants to certain seasons and certain bands of geographical latitude. It is entirely conceivable that, if the photoperiod response could be broken, two crops could be grown in one season where only one is now possible, forage legumes and grasses could be encouraged

to continue vegetative growth in pastures, sugar cane could be discouraged from setting seeds so food reserves would accumulate fully as sugars in the cane rather than as oils and proteins in the seed. It has been shown by Dr. Philip H. Plaisted of the Boyce Thompson Institute that the yield of protein per acre in orchard grass could be doubled by preventing flowering, and the grass remain palatable for much longer periods of time. Pastures probably are producing no more than one-fourth to one-half of their forage potential.

The flowering response is dependent upon chemical messengers that are transferred from the branches that are exposed to the proper photoperiod treatment, to untreated branches in at least some plants. A chemical which would destroy or accelerate the production of such bud regulants might be used to free plants of their complete dependence upon photoperiod.

It has been possible to replace a couple of hours of sunlight by use of synthetic chemicals upon chrysanthemums. The chrysanthemum normally does not set flower buds until the periods of sunlight begin to shorten in late summer and early fall. The same effect can be achieved by repeatedly covering the plants with a dark cloth for two or three hours in late afternoon. There is substantial evidence that the chemical messengers involved may be replaced, in part, by synthetic chemicals.

On many plants and their seeds, the embryonic bud does not initiate vegetative growth until it has undergone a process of chilling followed by restoration of conditions favorable to growth. If peach seeds or vegetative buds on a seedling are not exposed to chilling, they fail to grow normally. The seedling grows for three or four inches, but the internodes never elongate normally so the stem remains telescoped to give a plant known as a physiological dwarf. If the seed is held at 5° C. for several weeks, or if the seedling is chilled to this temperature, the seedling will make normal growth when placed in soil at a temperature of 20° to 25° C.

Some sort of chemical change is responsible for physiological dwarfing in the *Rosaceae*. There is some evidence that this material is generated in the leaf primordia adjacent to the growing point and may be an inhibitor. More recently, light has been found to correct the physiological dwarfing. If the dark periods are interrupted with supplementary light, plants will make normal growth. It has also been shown that gibberellic acid will break the physiological dwarfing phenomenon. So far it has been impossible to detect an active plant regulant or to isolate a chemical that would be influenced by light, chilling, or gibberellic acid.

The Problems of Senescence

Plant growth starts off with a flourish, proceeds to differentiation of special tissues, and then declines into a senescent condition. Leaves of temperate-climate plants drop periodically, usually after a frost. However, a young red oak, if held in a greenhouse and supplied with completely balanced nutrient solutions, will go through several cycles in a year, irrespective of the climate outside. Some mechanism regulates the process so that it goes through a periodic cycle.

The shattering of blossoms and the falling of fruit are considered forms of senescence associated with maturation processes. The natural processes may be accentuated many-fold by removing the organ from the foliage-bearing stem. Because of this acceleration of senescence, the cut rose bud has been losing popularity for several years.

A careful study shows that the metabolism of the rose bud changes progressively during the first three days after the bud has been removed from the bush. First it digests free organic acids in its respiratory processes, then it exhausts the sugar reserves, next it deaminates the free amino acids. Eventually proteolysis sets in, that is, proteins are broken down into simpler compounds which are then converted to organic acids by deamination. The latter processes release considerable ammonia in the petal tissues, and this reacts with the cyanidin pigments which become purple in an alkaline medium. Here is the explanation for the change of color, or blueing, in red and orange roses after they have been in a vase for three or four days.

With the foregoing biochemical data, it is possible to visualize what should be done to delay or suppress senescence in roses. Dr. Leonard H. Weinstein found that if respiration was retarded by inserting the stems in weak maleic hydrazide solution, the acids and sugars were not exhausted so rapidly and the petals remained fresh much longer. As a matter of fact, if the maleic hydrazide solution was too concentrated, the bud never opened sufficiently to reveal the full beauty of the petals. By use of aluminum sulfate or other heavy metals to mordant the cyanidin-diglycosides, it was possible to prevent a change in the red color for periods up to two weeks. If a combination of maleic hydrazide and a mordant were used jointly and were reinforced with dextrose, it would be possible to double the vase life of a rose.

The Induction of Disease

Very few microorganisms are inherently destructive to plants. However, many of them produce cytolytic enzymes, toxins, or growth regulants that give rise to adverse symptoms in plants. The so-called "soft-rot" diseases, caused by bacteria and fungi which attack fleshy roots, rhizomes, and fruits, are produced by pectinase and protopectinase enzymes that dissolve the middle lamellae between cells and thereby destroy the integrity of tissues. The wilt-inducing organisms establish themselves in the tracheal tubes where they produce a variety of toxins that change the turgor of tissues.

Among the leaf-spotting diseases there are a number that cause necrosis, chlorosis, and abscission. Some of these, such as the cherry yellow-leaf fungus, apparently hydrolyze amygdalin and cause necrosis of a few cells so that there is a "shot-hole" effect. The wildfire bacterium of tobacco produces a large yellow halo around a relatively restricted spot of invasion. The halo is attributable to tabatoxin, a compound that has been separated and identified as a new amino acid by Dr. D. Wayne Woolley and Dr. Armin C. Braun, and their co-workers at the Rockefeller Institute for Medical Research.

One of the most interesting developments in modern plant pathology and physiology has been the studies on the nature of virus. In the twenty-five years since Dr. Wendell M. Stanley isolated and purified the virus of tobacco mosaic, it has been shown to be a nucleoprotein. The nucleic acid part

(Continued on page 180)

RADIATION: AN AID IN PLANT IMPROVEMENT

By **Seymour Shapiro**

Dr. Shapiro is associate botanist in the Department of Biology at Brookhaven National Laboratory, Upton, Long Island, New York. The research discussed in the following article was carried out at Brookhaven National Laboratory under the auspices of the U. S. Atomic Energy Commission.

THE GOAL of plant breeding is to produce varieties of plants that are capable of performing certain functions in a more efficient manner than do varieties currently in existence. The plant breeder attempts to achieve this elusive objective (*elusive* because man's requirements and plant production problems are constantly changing) by manipulating genetic variability into a wide array of combinations of characteristics and then selecting those best suited to his needs. An important restriction placed on the efforts of the breeder is the natural limits of genetic variability. Among the factors that contribute to natural variation, hybridization and spontaneous mutation rank high. Man has used controlled hybridization as his predominant method of crop improvement. The truly enormous advances made in developing more efficient crop plants testify to the success that man has had with this approach. The second factor, mutation, has always been intriguing because of its contribution to the available pool of variability as well as for its fundamental significance in the process of evolution and in the science of genetics. Since the agents that are effective in molding the course of evolution are also applicable to plant breeding — which has been defined as evolution directed by man — mutations have been the subject of considerable scientific interest and intensive research. Eventual control of their occurrence and direction have long been a hope of both the geneticist and the plant breeder.

Mutation, defined as a structural alteration in the hereditary material (the genes) located within the nucleus of the cell, occurs suddenly and unpredictably. Although a number of such changes have resulted in desirable changes in cultivated plants, these fortuitous events occur infrequently and have therefore only rarely been a part of planned programs for crop improvement.

The first indication that one could experimentally increase the mutation rate came in the late 1920's from the researches of Drs. H. J. Muller and L. J. Stadler, working independently with fruit flies and barley seed, respectively. They discovered that by exposing their material to X radiation there was a substantial increase in the frequency with which certain obvious characteristics were changed to a different form. These pioneer efforts opened an entirely new and extremely profitable field of genetic research, for suddenly, for the first time, it was possible to produce mutations in large enough numbers to permit critical study. Scientists in several countries, particularly in Sweden, were quick to recognize the possible applications of radiation-induced mutations to the improvement of crop plants. The Swedish group has been singularly energetic in its exploitation of this new tool and has made important contributions to our understanding of the basic mechanism of the induction of mutations, as well as demonstrating practical, beneficial mutations in several crops.

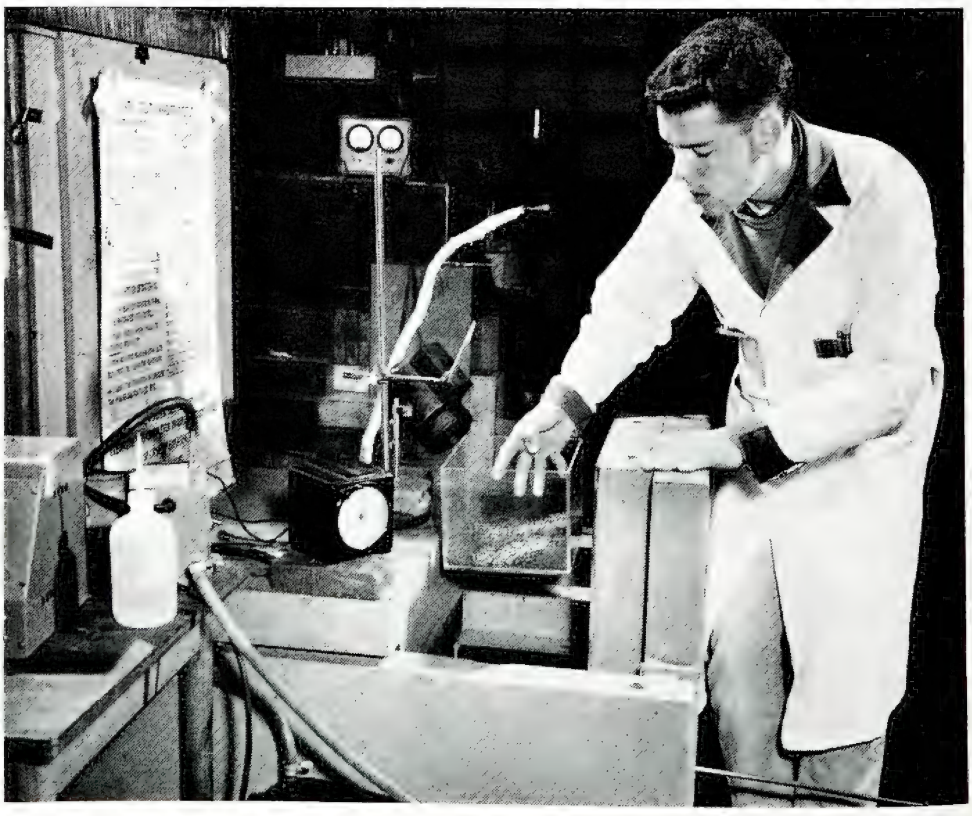
This entire area of research received an enormous stimulus in the post-World-War-II period when radioactive isotopes became readily and abundantly available. At the Brookhaven National Laboratory (a private research institution operated under contract with the U. S. Atomic Energy Commission to study, in a broad sense, the interactions of radiation with matter) a cooperative program was established in 1952 to enable plant breeders and agriculturists in the United States to make use of a broad spectrum of

Plants in the two-acre Brookhaven Gamma Radiation Field. The 2,000-curie cobalt-60 radiation source rests in a protective shield below ground when observations are being made in the field. To expose plants to the gamma rays emitted by the cobalt-60, the source is raised into the hollow steel pipe seen at the right center of the photograph. An underground cable connects the source with a winch at the extreme edge of he field. Plants are exposed for twenty hours each day; those nearest the source receive the highest dose rates. For short-term exposures potted plants are set in position on the wooden platform. For long-term, chronic exposures specimens are planted directly in the field.

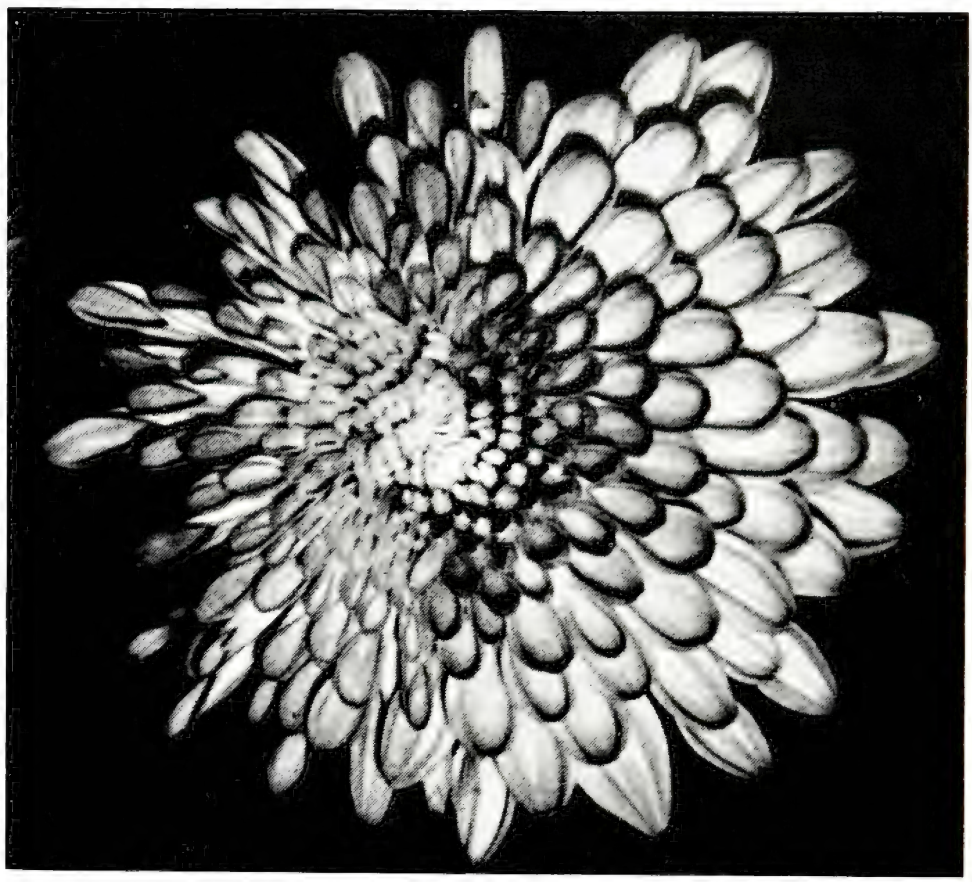
radiation techniques in their plant improvement programs. A similar project is also now in operation at the laboratories of the University of Tennessee Atomic Energy Commission Program. More than two hundred and fifty scientists in universities and agricultural experiment stations throughout the United States and in twenty-five foreign countries have participated in this work. The breeders consult with scientists at Brookhaven about their special problems and needs in any given crop and, if it seems likely that radiation may be successfully employed to produce a recognizable mutation for a desired characteristic, seeds, cuttings, and even growing plants are shipped to the Laboratory for treatment. Seeds and cuttings are generally exposed to thermal neutrons in the nuclear reactor, and also to X rays using a conventional X-ray machine. Growing plants are exposed for periods from one day to several months, or possibly even years, in a ten-acre radiation field which employs two thousand curies of the radioisotope cobalt-60 as a source of gamma radiation. The irradiated material is then returned to the cooperating plant breeder, who grows the plants and carefully screens them for the sought-after changes. Brookhaven is kept informed of the progress of the work, furnishes advice as required, and acts as a coordinating center in putting scientists with similar interests and problems in communication with one another.

How does radiation produce a mutation? What does it do to the cells of the plant to produce such a fundamental change? The determiners of development, called *genes,* are organized on and constitute a part of certain discrete structures, called *chromosomes,* which are within the nucleus of every cell of all plants and animals. In order then to change the pattern of inheritance, one must alter these genes or their arrangement on the chromosomes. Radiation, whether it be light, heat, X rays, neutrons generated in an atomic reactor, or the alpha, beta, or gamma radiation emitted by radioisotopes, is a form of energy, and energy is capable of performing work. With the exception of light and heat, all the radiations just mentioned are called *ionizing radiations* because they produce, either directly or indirectly, charged atoms called *ions* as they pass through matter. The effects I am here concerned with are intimately associated with this property of ionization production. When energy, in the form of ionizing radiation, is beamed through tissue, some of it will strike the chromosomes of the nucleus of one or more of the cells. In traversing the chromosomes some of the energy is absorbed, and this may result in a structural change in the molecules of which the chromosomes and genes are constituted. Depending upon such factors as the intensity of the radiation, the sensitivity of the site on the chromosome at which the radiation is absorbed, and the amount of energy absorbed, these molecular changes may or may not be microscopically detectable. Small alterations that may not be accompanied by any microscopically detectable changes may, however, be the cause of obvious changes in the growth and behavior of the plant. Such changes are called *point mutations.* Often, however, the amount of energy absorbed is sufficient to break the chromosomes, and the broken pieces can be clearly seen upon microscopic examination. Changes of this magnitude are called *chromosome aberrations.* Broken chromosomes may rejoin. Often several different chromosomes in the same cell may break, and rejoining of the broken ends may take place in combinations that are quite different from the original. A broken end of one chromosome may become joined to a broken piece of a second chromosome, and so on. Small fragments of chromosomal material may never rejoin and may become permanently lost to the chromosome complement. In these new relationships, with new "neighbors", the genes may express themselves differently, and new characteristics become apparent in the plant.

The interplay of all these factors, point mutations, chromosome aberrations of all sorts, and the consequent gene rearrangements and losses, creates a huge pool of variability which can then be sampled for particular combinations of advantage. The greater part of this newly created variability will be deleterious, and sterility runs high in such material. Most of the resulting plants will be discarded by the plant breeder. However, if one has specific objectives of improvement in mind and can employ accurate and efficient means of screening large populations so as to reveal the presence of the rare



Seeds, in a plastic container, are being put in position to be irradiated with neutrons in the nuclear reactor. The rod, seen below the technician's knees, will be used to push the plastic box onto a small elevator which will then be lowered partly through the reactor shield for exposure to the neutron beam.



An incomplete sport of the 'Masterpiece' chrysanthemum, a lavender-pink type. The sport, which comprises the left half of this flower, is an orange-bronze color characteristic of the 'Bronze Masterpiece'. Flowers arising lower on the stem from the same side as the orange-bronze half of this flower were completely of this color. Flowers arising from the right half of the stem were all of the normal lavender-pink 'Masterpiece'. In addition to the change in color, changes in petal size and form between the two halves of the flower are also noticeable.

individuals that carry the desired traits, then the sacrifice of large numbers of plants is of no great consequence. Such traits as improved flower color, increased or reduced plant height, changes in flowering or fruit-ripening time can be directly observed if they appear in the irradiated population. More subtle characters, such as disease resistance and drought or temperature tolerance, are not immediately obvious except as a response to a particular stress, and the scientist must use natural or artificially created stress conditions if he is interested in locating individuals with these characteristics in an irradiated population or in the progeny of an irradiated population.

From the previous discussion of the site of origin of the mutational event, it should be clear that when a mutation takes place it occurs in a single cell. This cell generally must divide a large number of times to produce enough tissue for the mutation to be recognized and used. Mutations that occur in cells that are not destined to divide further are almost never detected and are certainly of no practical use. If the plant is propagated by seed, the tissue derived from the mutated cell must extend into the flower and reproductive structures if it is to be detected and used. In plants propagated asexually (as by cuttings), the altered tissue must reach into a bud from which it can then be propagated and increased. Only a few seeds or a few buds first display the mutation. For this reason, the new type will generally appear as one branch, all or part of which is distinctly different from the remainder of the plant. From this initial appearance of the "sport," one must propagate a large enough population to permit a critical evaluation of the new type. He must determine whether the mutation differs from the original only in the single originally detected character, or whether this new change is perhaps associated with other alterations that might be disadvantageous. Some new traits may not be useful in the varieties in which they were discovered but must, by hybridization, be introduced into different varieties. One must therefore determine the means of inheritance of the new characteristic if maximum benefit is to be made of it.

In addition to its mutagenic properties just discussed, radiation may produce beneficial changes of a permanent sort by a different mechanism. Most plants possess the same genes in all of their cells. However, despite this fact, the expression of a gene depends upon the location in the plant of the cell that carries it. For example, although root cells contain the same genes for flower color as are present in the cells of the petal, only the color genes present in the cells of the petal have an opportunity to control the color of the flower. I must now qualify the statement that all cells of an individual have the same genes. Certain asexually propagated perennials, both woody and herbaceous, are known to have developed a condition in which certain tissues of the plant have cells that carry genes that differ from those in the rest of the plant. These two distinctly different sets of genetic material may exist side by side in a completely compatible and stable relationship. Such plants are known as chimeras, and a surprisingly large number of important horticultural plants are of this type.

In the course of some radiation experiments with the Sim Group of carnations, Dr. Y. Sagawa and Dr. G. A. L. Mehlquist, working at Brookhaven and the University of Connecticut, discovered that when plants of the variety 'White Sim' were irradiated with an appropriate dose of X rays or gamma rays, some sixty per cent of the irradiated branches produced red flowers rather than the usual white. In a similar fashion, irradiated 'Pink Sim' plants also produced large numbers of red-flowering branches. These red-flowering branches appeared in every respect to be identical with a third Sim variety, 'William Sim', and it was known that both 'White Sim' and 'Pink Sim' had originated as spontaneous sports of 'William Sim'. Breeding tests revealed that both 'White Sim' and 'Pink Sim' were chimeras and contained an internal core of tissue with genes for red flower color ('William Sim'). However, presumably by spontaneous mutation in one of the outer cell layers at some earlier time, these cells were now overlaid by tissue with

genes for the expression of white or pink flower color. As color in the carnation flower is located only in the outermost cell layer of the petal, only cells in that position are able to express their color genes. The conversion of the red-white ('White Sim') and red-pink ('Pink Sim) chimeras into red-flowering plants must somehow have permitted the core cells with red flower color genes to reach the surface and gain expression. An anatomical investigation by Dr. Sagawa revealed that the radiation treatment had selectively destroyed several of the outermost layers of cells at the stem growing point. These dead cells were sloughed off and replaced by cells from the central core of the stem tip, until a new and complete growing point was reconstituted. The chimeric nature of the branch was thus eliminated, and when the branch ultimately flowered, the previously latent red flower color genes were in the proper peripheral location favorable for their expression. This type of radiation effect is not restricted to carnations. Results similar to these have been obtained with chrysanthemums, roses, and geraniums, and it seems likely that this method will be extremely useful and will uncover the presence of numerous new characteristics, already present but masked in the plant.

I have reviewed some features of the history, the methods, and the theoretical basis for using radiation in the search for new and improved plants. What are the accomplishments of the radiation approach thus far? Among horticultural plants, those of primary interest to the present readers, a number of new and interesting types have been produced. At Rutgers University, Prof. L. F. Hough and his associates have been studying the effects of radiation on peach trees. Sports for both earlier- and later-ripening fruit have been found as single branches, or parts of branches, on trees of the varieties 'Fairhaven' and 'Elberta' that had previously been irradiated in the Brookhaven gamma radiation field. A late-ripening 'Elberta' sport seems particularly promising commercially. Some of the peach mutations have also resulted in firmer fruit flesh and changed fruit texture. In the variety 'Brackett' a sport was discovered from the normal freestone to the clingstone pit condition. Horticulturists at other institutions have reported fruit color changes in apples and pears, a larger-fruited muscadine, and disease-resistant currants.

In floriculture, Prof. G. A. L. Mehlquist of the University of Connecticut has selected several improved carnations from his radiation experiments, and these are now being evaluated under commercial growing conditions to determine their over-all suitability for release as new varieties. These selections include changes in color, flower form, and increased vigor of the plants. Flower color changes, largely because of the ease with which they can be detected, have been found in a large variety of species, among them being the African violet, cyclamen, phlox, snapdragon, tulip, rose, chrysanthemum, geranium, and petunia.

Since work was started earlier with agronomic plants than with horticultural ones, one can expect, and one finds, that the status of research with agronomic species has progressed further. Six new varieties have been released to the farmers of the world as a consequence of radiation experimentation. Three of these new varieties were developed and released in Sweden, the country first to initiate such studies on an intensive level. These radiation-produced varieties are 'Primex' white mustard, 'Regina II' summer oil rape, and the 'Weibull Stralart' fodder pea. A new bean, called 'Shafer's Universal', has been released in Germany, and the 'Sanilac' navy bean and the NC4X peanut are the results of efforts in Michigan and North Carolina respectively. In addition to those already on the market, a much larger number of potentially useful mutations are undergoing extensive testing and evaluation which will determine whether they are directly useful, useful when incorporated into other existing varieties, or of no value because of concomitant deleterious features from which the useful trait cannot be separated. Radiation-induced characteristics at this stage in development include dwarf forms of rice, sorghum, and barley with little or no accompanying loss of yield (but which render the plants less susceptible to wind damage); stiffer straw and altered grain-ripening time in a variety of small grains; disease resistance in wheat, oats, flax, peanuts, barley, and bluegrass; and increased yield in several different species. When one considers the relative infancy of research in this field, the long period required for testing selected mutations and sports, and the large number of still unanswered theoretical questions, the answers to which will undoubtedly increase the efficiency with which radiation is used, the results at this point seem highly encouraging.

'Better Times' rose at the left and one of its radiation-induced sports. 'Better Times' is a dark red rose; this sport is very pale pink with a slightly darker pink center. The sport is considerably lighter than either 'Briarcliff' or 'Columbia', pink roses present in the ancestry of 'Better Times'.

OPEN GARDEN DAYS

OCTOBER 18 and NOVEMBER 15, 1960

The New York Botanical Garden announces that these scheduled dates are the only ones when guided tours are available. Garden clubs, educational groups and individual members are welcome.

NEW GARDEN PLANTS

A discussion of some recent introductions and some less-known plants of proven garden merit.

By James S. Wells

Mr. Wells, who operates his own nursery at Red Bank, New Jersey, is the author of *Plant Propagation Practices.*

WHAT IS A NEW PLANT? You may think that this is a somewhat pointless question, but in a recent catalogue rhododendron 'Mars' was listed as a new plant, and to many growers it is. However, this variety was first raised in 1875 and has been available from rhododendron nurserymen for at least seventy-five years. This may be an extreme example, but it does emphasize that it takes a long time for a really new plant to become distributed, and that it can truly, perhaps, be considered a new plant for at least a quarter of a century.

Actually, so many varieties are available in almost any species, that the so-called "new variety" needs careful scrutiny before it is accepted as being worth growing. If a "new variety" is all we want, a handful of seeds of almost any plant will produce "new" varieties in profusion; but if we want a plant with distinct and improved characteristics that make it better than those we have been accustomed to grow, such a plant may be available.

Within recent years a number of plants, most of them new, one or two of them old and relatively unknown, have been presented to gardeners as worthy of their notice. Here is a résumé of some of the best in the current nursery catalogues.

One would hardly think that we need any more azalea varieties, for over fifteen hundred named sorts are available from nurseries in this country. Unfortunately many of these are duplicates, and there is room for really good azaleas in certain categories. In this northeastern area one of the criteria upon which a new azalea has been judged is hardiness. Will the plant stand our winters?

Secondly, does it have some characteristic of plant or flower that makes it more desirable than the standard variety in use? Judged on this basis, several varieties of azaleas are worthy of consideration.

Azalea 'Eureka', a U. S. Department of Agriculture introduction from Beltsville, Maryland, has proved to be extraordinarily hardy. It is an excellent replacement for 'Coral Bells', which is not hardy under normal garden conditions. 'Eureka' is a Kurume type, that is to say, broad and compact, with pale but clear pink flowers and a slightly deeper center. Its foliage is a glossy green.

Azalea 'Polar Bear' gives promise of being the hardiest compact white variety at present available. It is very much more hardy than the standard Kurume azalea 'Snow'. The flowers are hose-in-hose and of good substance. The foliage is a glossy green as opposed to the rather dull green of 'Delaware Valley White' or *A. ledifolia alba.* 'Polar Bear' is also a U. S. Department of Agriculture introduction.

Joseph Gable of Stewartstown, Pennsylvania, has originated a number of rhododendrons and azaleas of outstanding merit. Three are now coming into general use as really first-class, hardy azaleas. The first is a pale pink, completely double-flowered variety called (most aptly) 'Rosebud'. It is not, in the strictest sense, a new plant because 'Rosebud' has been offered for some time, but it is only now coming into general use. This charming plant is usually in full bloom for Memorial Day and therefore extends the natural azalea season by some two to three weeks. Azalea 'Lorna' is another Gable variety, even lower and more compact than 'Rosebud'; its flowers are a somewhat deeper pink with a slight touch of mauve. It is a very pleasing plant and above all completely hardy. Mr. Gable's best hardy red azalea is called 'Stewartstownian'; the red is a true blood-red with no tinge of purple or magenta. The plant, a Kurume type, quite compact, is exceptionally hardy and is clearly superior to other red varieties such as 'Addy Wery', 'Sherwood's Red', and *A. obtusum* var. *hinodegiri.* The leaves are a dark glossy green, and the stems turn to quite a deep brown-red.

I recently acquired a plant of *Cotoneaster dammeri,* and from all accounts it appears to show possibility as a most interesting groundcover. It is completely prostrate, running flat along the ground and rooting vigorously at the joints where the stems come in contact with the soil surface. It has insignificant little flowers in the axles of the shiny green leaves, and these are followed by bright red berries in the fall. *C. dammeri* appears to be completely hardy in this northeastern area; the plant which I acquired came to me from Canada where it is growing without difficulty. This can not strictly be called a new plant, yet it is not generally available. If acquired, it will, I think, prove of real interest and value to the home gardener.

Another interesting introduction from Canada is the lovely hybrid daphne 'Mertensiana'. This plant, a little shrubby evergreen, is somewhat similar to daphne 'Somerset' but retains its leaves through the winter except under very severe conditions. Each stem is tipped in spring with a cluster of very fragrant, deep pink flowers; not spectacular in form but attractive and particularly so from the point of view of scent, an almost neglected garden attribute which I think any keen grower should try to provide in his garden. The plant does need a little protection, particularly when young, because the tips of the new growths that are made in the fall seem to be susceptible to winter wind injury. Evergreen boughs, placed in the ground to arch over the plant, will furnish light protection and assure its coming through the winter without damage. This is one of the few shrubby evergreen daphnes that are available to us in this area.

Two excellent magnolias have been recently introduced. The first, *Magnolia stellata* 'Royal Star', grows in a manner similar to *M. stellata* but has the most useful attribute of flowering two or three weeks later. This means that the flowers, which are borne in profusion on the young plants, are usually free from frost damage, an important point for the proper enjoyment of this plant in the springtime. Magnolia 'Dr. Merrill', an introduction from the Arnold Arboretum, is a cross between *M. stellata* and *M. kobus.* It forms a vigorous tree, rather similar to *M. kobus* but with a much heavier blooming habit. Magnolia 'Dr. Mer-

rill' is a tree for a fairly large area, because it will eventually reach twenty-five to thirty feet in height and probably ten to fifteen feet across. It is most pleasing in leaf and in flower and has a distinct value.

Another interesting introduction from the Arnold Arboretum is *Prunus* 'Hally Jolivette' raised by Dr. Karl Sax. This is a really delightful plant for any garden, large or small. It is somewhat similar to *Prunus triloba flora plena* but has a much daintier habit of growth and flowering. *P.* 'Hally Jolivette' ultimately forms a shrub, maybe six to eight feet high, although it can be pruned to a lower height. It is completely hardy and would probably be so under much more extreme conditions than are prevalent in this area. In addition, it has one quality which endears it to me greatly, that is, the flowers are produced for nearly a month in spring. Last year I noticed that the first blossom on the plant in my garden opened on April 12. As spring advanced, the quantity of blooms steadily increased; all the while the semi-double flowers, which are borne on long pedicels, were continually being produced from the tips of the stems, and flower buds were coming out. This means that the heaviest display of blossoms is probably to be had around May 1. I can heartily recommend this hybrid flowering almond to any gardener who wants something a little different and interesting for early in the spring season.

Rhododendrons are of particular interest to me. There is, of course, a tremendous number of new varieties coming along, but I shall mention only three that have been introduced and should be available in certain well-stocked garden stores here in the East. These three are a selection from the numerous Dexter Hybrids which were raised on Cape Cod in Massachusetts by the late C. O. Dexter. These rhododendrons have a very mixed and, unfortunately, unknown parentage. Tens of thousands of seedlings were distributed by Mr. Dexter to all parts of the country and a committee is now attempting to evaluate and select from this vast material those that seem to be clearly superior. One of these seedlings has been selected and named 'Scintillation'. The original plant grew for many years in the Dexter collection at The New York Botanical Garden, where it was observed and remarked upon by growers throughout the East. Unfortunately, a terrific flood one summer completely destroyed the original plant, but young material had been established in one or two nurseries and 'Scintillation' is now being propagated and distributed. In my opinion, this rhododendron has almost all the qualities of a really first-class plant. It is delightful to look at in or out of bloom, and completely hardy; it was untouched by the rigors of the extreme winter of 1958-9. The leaves are large and a deep glossy green, unusually fine foliage in a group of plants renowned for their good foliage effect. Finally, the plant produces massive trusses of clear light pink flowers, each of which has a yellow cast in the center of the trumpet. As if all this were not enough, the plant, which is a cross with *Rhododendron fortunei,* has a natural fragrance; not strong (this is true of any of the fragrant rhododendrons), yet sufficiently discernible and distinctive to be enjoyed by the gardening connoisseur.

The standard set by 'Scintillation' is difficult to match, and the two other Dexter Hybrid rhododendrons that are being propagated do not quite equal 'Scintillation' in all respects. 'Morris #3' has been selected from the group which is growing at the Morris Arboretum in Philadelphia. The luminous quality of its deep rose-red flowers has justified its selection and propagation. The habit of growth is not as good as it should be, in that the plant can become leggy if it is not pinched and cared for so as to construct a well-formed bushy plant. Given this structure however, 'Morris #3' plant will develop satisfactorily. A third Dexter is still being grown under the number 62, although I am sure it will shortly be named. This came from a group which Mr. Dexter sent to Seattle, Washington. The leaves resemble those of 'Scintillation' in being large and a glossy green. The flowers which open a light cream and fade to a rich off-white, have a yellow center. The young unfolding buds are a light pink. As the flowers develop, the pink buds surmount the opening cream flowers and their yellow centers—a most unusual color combination; and as an additional attraction, the flowers are fragrant.

I must not overlook the foundation evergreens, such as yews. There are two excellent varieties with distinct qualities that justify their inclusion in any good garden planting. The first is *Taxus cuspidata nigra.* This spreading form of *T. cuspidata* has an almost black-green foliage. Even under adverse growing conditions this dark green color persists. The plant has the natural stamina and vigor of growth of *T. cuspidata,* and as its color is so much better, there seems to be no point in continuing to grow the more ordinary form. A second variety of *T. cuspidata* is *densiformis.* This is a semi-upright or should I say semi-spreading form which lives up to its name, for it is dense, relatively compact, and yet vigorous in growth. *T. cuspidata densiformis* can be trimmed to make a very fine medium-size hedge plant, or it can be left to grow into a really excellent specimen of unusual compactness; yet this compactness is combined with vigor which takes it out of the really dwarf class. For a dwarf yew, there is *T. cuspidata nana.*

Finally, I come to two flowering shrubs, two viburnums, both relatively recent introductions and both excellent. Most of my readers probably will have seen or grown *Viburnum carlesi,* a pleasing shrub which produces large round heads of creamy white flowers, deliciously fragrant. A compact form of this has been raised by a nurseryman in Rhode Island; it is covered with similar heads of fragrant blossoms, and for the modern home and the small garden is a desirable subject. Where more space is available, then the hybrid *V.* 'Carlcephalum' is well worth growing; a cross between *V. carlesi* and *V. macrocephalum,* this is a vigorous plant with dark glossy leaves and really large heads of fragrant blossoms.

I close this brief review of some of the newer and better plants that are currently available, by looking ahead at some of the things that may be offered in a year or two. Recently I was shown a picture of a new clematis, an improved form of the hardy *C. montana rubens.* This has much larger and deeper pink flowers and a greater vigor of growth, if this is necessary, for *C. montana rubens* grows vigorously enough. The size of the bloom brings

(Continued on page 177)

PERENNIALS:

An Evaluation of Their Cultural Requirements

By Andre Viette

Mr. Viette is lecturer, horticulturist, and manager of the Martin Viette Nurseries, a seventy-acre establishment at East Norwich, Long Island, devoted to herbaceous perennials. He is mainly interested in the pollination of hemerocallis with emphasis on the use of colchicine, and the breeding of Lobata and Early Hybrid peonies on the later Albiflora Hybrids. Tests are being conducted, under the supervision of the Cornell Ornamental Research Laboratory at Farmingdale, with different chemicals to determine the phytotoxicity of plants and the control of various weeds.

Aster alpinus 'Goliath', with large flowers of light blue-purple, may be used in the rock garden or in the foreground of a perennial bed.

IN THE PAST considerable emphasis has been placed on the proper selection of perennial plants rather than on their cultural requirements. Because of the fallacies about perennial culture, it is important to have a basic understanding of the relations between plant and soil.

The old idea of duplicating as closely as possible, in culture, the soil conditions of a plant's natural habitat is at times the wrong approach, for a number of plants thrive on soils different from those of their normal habitat environment. A good soil structure prepared to a depth of two to three feet in the garden has proved more beneficial. Using peat instead of humus in the soil has resulted in the better growth of many woodland plants. Applying water and nutrients has also been helpful. Many plants (halophytes or cacti) only tolerate their natural ecological conditions and grow much better when planted in good garden soil.

Organic materials have been applied and worked into the soil for generations. Manure has probably been used more than any one other organic material, but it has disadvantages as well as advantages, and its use in gardens has lessened as its disadvantages have come to light. Manure improves the structure of the soil and increases its capacity for water infiltration and the bacterial count. The increase of microorganisms is an advantage in the breakdown of organic material; but when microorganisms multiply to a great extent, some compete seriously with the plant roots for oxygen. When high applications of manure have been worked into the soil, a condition of low oxygen and high carbon dioxide may result in a decrease of root growth. The lack of oxygen is also likely to impair the absorption of water and nutrients.

The fertilizing value of manure has been overestimated; fresh cow and horse manure have a total fertilization content of only one or two per cent. My own experience has shown that when large amounts of fresh manure are applied, the plant may die through poisoning of the roots or gassing of its upper part.

The weed-seed content of manure is very high. After manure has been applied to relatively weed-free soil, I have seen a vigorous crop of assorted weeds appear. When fresh manure is used, flies and odor may be other problems, and there is a much higher incidence of disease in a perennial garden.

One of the greatest disadvantages of fresh manure is its rapid rate of decomposition. In preparing a soil medium the gardener wants an organic material that will last for a long period. If fresh manure is used, the soil will have lost most of its good structure at the end of two years. Well-rotted manure is less harmful in some respects than fresh manure.

Artemisia schmidtiana nana forms a pleasing low mound of fine silver-grey leaves.

Tiarella wherryi bears pale pink flowers above attractive heart-shaped leaves.

Sawdust has come into use within recent years. Since it consists mostly of high amounts of carbohydrates, it may bring about a rapid increase in certain microorganisms, which results in nitrogen deficiency. This depression of nitrates is caused by soil microorganisms consuming the sawdust as food, and the condition must be remedied by applications of a nitrogen fertilizer.

Leafmold and composts are organic materials that may be acid or alkaline, depending upon their origin. They decompose relatively quickly, although not so quickly as fresh manure. They improve soil structure and are relatively low in fertility.

Peat improves the soil structure but is extremely low in fertility; fertilizer should be added with it. Because I want my garden to last from four to ten years, I select an organic material that will endure for that period. For this reason I choose peat as the best organic material. The acid effect of peat is beneficial for acid-loving plants in a woodland garden, and with the applications of limestone peat is a fine organic material for lime-loving plants.

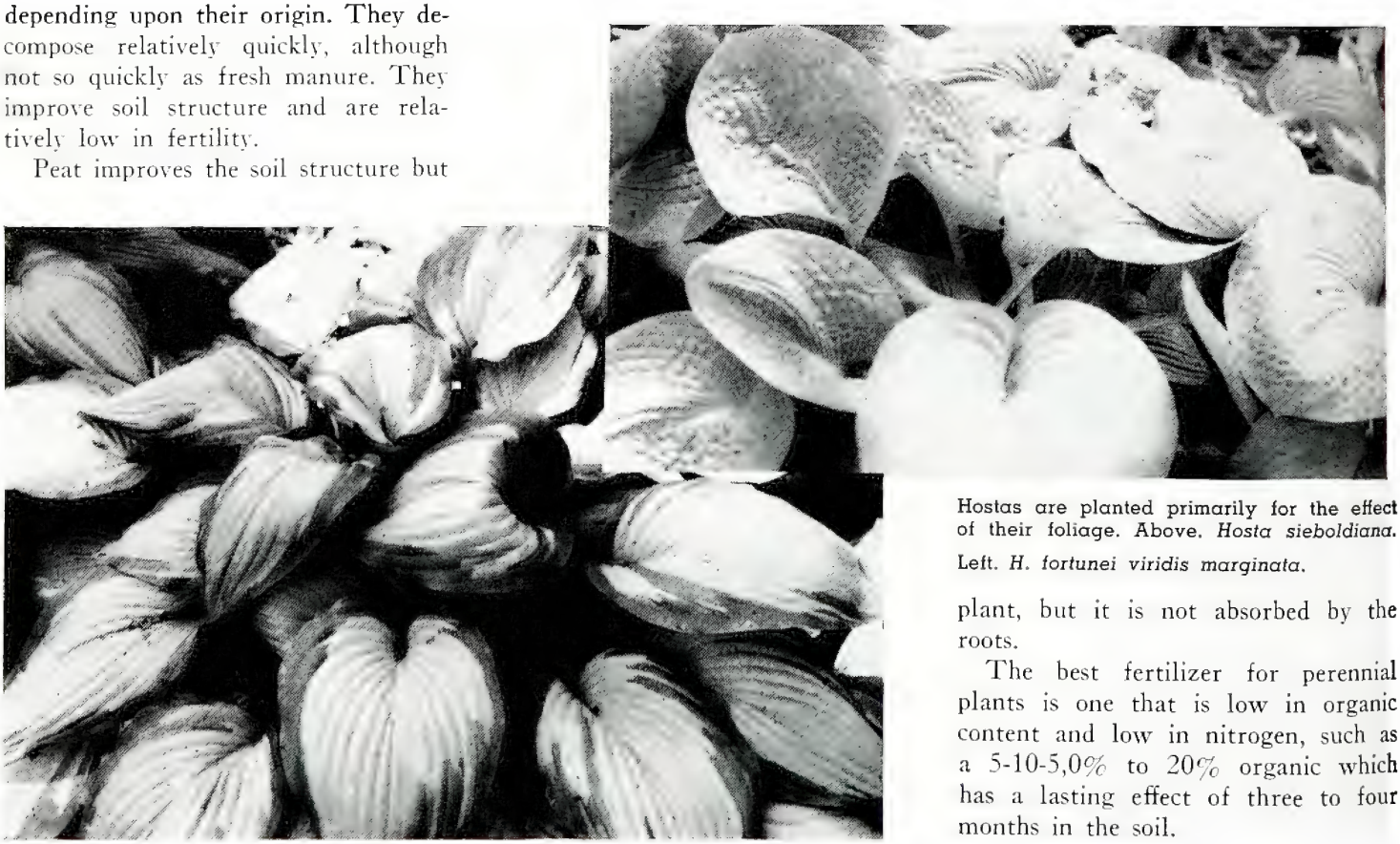
Once a soil decomposes, the gardener cannot improve it greatly from above the surface; he is then compelled to redo the whole garden.

Organic fertilizers may be fast-acting or long-lasting. In this article, I am discussing organic fertilizers which break down slowly. Nitrogen can cause erratic differences in the vegetative growth of perennial plants. With high-nitrogen organic fertilizers, plants of soft, succulent growth and few flowers frequently develop; such plants are usually more susceptible to injury from disease. Application in late spring of high-nitrogen organic fertilizers which break down slowly may cause plants to be soft and succulent as they enter winter.

Application of acid fertilizers is not necessary on most acid soils, such as those of Long Island; there is no need to make soils of pH_{4-6} more acid than they already are. Although in such soils there may be some deficiency in the minor elements, the latter are usually present in sufficient quantity for good plant growth.

Vitamin B is not needed as a fertilizer additive. It is synthesized by the plant, but it is not absorbed by the roots.

The best fertilizer for perennial plants is one that is low in organic content and low in nitrogen, such as a 5-10-5,0% to 20% organic which has a lasting effect of three to four months in the soil.



Hostas are planted primarily for the effect of their foliage. Above, *Hosta sieboldiana*. Left, *H. fortunei viridis marginata*.

Most perennial plants thrive in a loam soil that has adequate drainage, aeration, and water-holding capacity. It would be impractical, because of the labor and time involved, to prepare a special soil medium to meet the ecological requirements of each kind of perennial plant; one is prepared that will benefit the greatest possible number of perennials in the garden.

The following is a basic method for the preparation of a herbaceous border, rock garden, or naturalistic planting. For a garden in the shade two to four inches of peat are placed on the surface of the soil. No limestone is used, since most of the shade plants grow best in $pH_{4.5\text{-}6.5}$. Thirty pounds of 5-10-5 fertilizer per one thousand square feet are spread and with the peat worked in well to a depth of one foot. For a garden in the sun two inches of peat are placed on the surface of the soil. Thirty pounds of 5-10-5 fertilizer and fifty pounds of limestone per one thousand square feet are worked in well to a depth of one foot. The amounts of fertilizer and lime will vary with the nature of the soil.

With some exceptions, perennial plants may be moved at any time of the year — during bud initiation, bud development, flowering, or post-flowering period. The best time to divide perennials varies from one plant to another, early spring and early fall are, however, the safest periods for the propagation of most perennials by division.

Many people water lightly with a hose day after day after planting, a process which results in an extensive root system forming at the surface of the soil and a poorer root system at a greater depth. These surface roots are subject to drought in summer and freezing in winter, and as this practice discourages deep rooting, the plants may die. Even more damaging to perennial plants is the recommendation made by some growers to water continually and heavily day after day and week after week after planting. When the soil moisture has reached a level considerably above the wilting point, further watering is likely to be not only wasteful and without any useful effect, but actually detrimental to the plants. A good soil structure is one in which the organic material, including the soil colloids, has a high waterholding capacity and a fair amount of pore space to ensure good drainage and aeration. The important water for plant growth is not the gravitational or drainage water that is applied in watering, but the water that is held in the soil after the excess has drained. Drenching the soil continually will keep the pores filled with water; a deficiency of oxygen may result and affect the respiratory process of the root. Toxins may build up, and death of the plants may follow. The less the oxygen content, the less the absorption of water and nutrients. After the initial thorough watering after planting, enough water is present in the soil for all the vital processes of plant growth until the condition of the soil indicates the need for water.

The correct procedure is to water gently with a sprinkler and to great depth. Gently watering is imperative so that the soil structure is not destroyed. There is no rule for watering, since this procedure depends upon the amount of rainfall. During a period of adequate rainfall in the spring, watering

Polygonatum multiflorum with pendant white flowers is one of the most appealing of the spring-blooming perennials for a shady or naturalistic planting.

Above. *P. multiflorum* with *Epimedium alpinum* (lower left), *Tiarella wherryi* (center), and *Primula acaulis* (lower left).

Right. Close-up of *P. multiflorum*.

may not be required at all. During dry spells, watering may be required once a week on heavy soils, and every four days on lighter soils. It may be done at any time of day; however, watering in the afternoon and evening is not advisable because of the disease problem.

Incipient wilting will occur even when water is readily available to the plant, if the rate of loss exceeds the rate of absorption. Watering cannot offset this physiological effect, since there is already plenty of water in the soil. This transient wilting is not detrimental to the health of the plant and should not alarm the gardener.

There are two basic types of mulches —winter mulch and permanent mulch. A winter mulch is a material, such as salt hay, which is applied in late fall to shade the ground and to keep the alternate freezing and thawing at a minimum until it is removed the following spring. A permanent mulch remains on the surface from year to year. It protects the soil structure, prevents erosion by wind and rain, conserves soil moisture, and controls weeds. The advantages of a permanent mulch are frequently publicized, but the disadvantages are very rarely made known. The warmer non-frozen soil beneath a permanent mulch attracts mice, and they may damage certain plants. Fire may be a hazard with some dry mulches. When a peat mulch becomes dry, it is impermeable to water, and the water runs off to outlying areas with plants in the garden receiving little of it. If the mulch becomes moist, it absorbs most of the water and holds it with great adsorptive tension, rendering it unavailable to the plant. The water later evaporates quickly, with little reaching the plant roots. If the peat is kept continually moist, it will promote a condition beneficial to root growth, and the peat will then become part of the soil medium rather than a mulch. Death of many shallowed-rooted perennials can result from the drying and freezing of the roots. Fresh sawdust (if it contains less than one and a half per cent of nitrogen) as a mulch may result in a nitrogen deficiency; decomposed sawdust may provide a finely particled medium in which roots may form. A mulch will buffer the soil temperature and keep the soil warmer later in the season; with certain plants, this may result in a soft growth later into fall. Buckwheat hulls have a neat appearance, but some toxicity to shallow-rooted perennials has been noted. Weathered buckwheat hulls that are relatively nontoxic in effect should be used.

Euphorbia myrsinites, a fleshy, decumbent perennial, will trail over a sunny rock wall or may be planted in full sun in a rock garden.

Manure has been used as a mulch for lawns, perennial gardens, and roses for many years, but its disadvantages outweigh any possible advanatges. It seeds the garden with many weeds, it may be directly or indirectly toxic to the roots, and it may cause an oxygen deficiency. Incidence of disease has been much higher when a mulch of manure has been used on iris and peonies. Perennial plants must be lightly mulched, for raising the level of the bed or border after they are planted may be detrimental.

A good mulch must fill the following requirements: 1) It must allow most of the water to pass through it, absorbing very little. 2) It must act only as a mulch, not as a soil medium, and be coarse enough to inhibit root growth in it. 3) It must not be toxic. Many mulches fulfill these requirements, such as leaves, non-toxic seed hulls of many types, coarsely ground corncobs, wood chips, sugar cane, and gravel.

Some Unusual Perennials

There are many unusual plants for perennial borders, rock gardens, and woodland plantings, and today, thanks to hybridizers, a wide selection of outstanding cultivars which add color, flower size, and vigor to the perennial collection. I use the term "unusual" for those plants which are not readily available at local nurseries; here are a few which I recommend.

Euphorbia myrsinites is a hardy prostrate perennial, with spiraled leaf arrangement and yellow flowers in umbels. Its main use is in the rock garden or trailing over a rock wall. *E. myrsinites* prefers a well-drained soil and full-sun exposure. It has no major insect or disease problem. If the plant becomes too straggly, it may be cut back to the center of the clump; but care must be taken in doing this, since the sap may be irritating to the skin.

Polygonatum multiflorum is a fine spring-blooming plant, with pendant

white flowers, which may be used in a naturalistic or shady garden. It prefers light to medium shade, although it will grow in the extremes of full sun or very deep shade. It requires a peat or humus soil and adequate moisture. The foliage of *P. multiflorum* furnishes a fine foil for cut flowers of annuals and perennials in flower arrangements. This plant, approximately thirty-six inches in height, has few insect and disease problems.

Aster alpinus 'Goliath' requires full-sun exposure and a well-drained, medium-loam soil. It is suitable for rock gardens and the border of herbaceous perennial gardens. This form of *A. alpinus* bears large flowers of a light blue-purple around June 1.

Artemisia schmidtiana nana is a silver-gray perennial which grows to about ten inches high. It is attractive in the border of a perennial garden or in a rock garden. This fine foliage plant, relatively free from insect pests and diseases, grows best in a well-drained loamy soil.

There are many species and varieties of *Hosta* (*Funkia*)—and much discussion about the correct species names. The hostas or plantain-lilies are very adaptable plants. They grow best in light shade, but will tolerate deep shade and full sun. They prefer a soil of good organic content and adequate moisture, but will tolerate dry or very wet conditions. They may occasionally be attacked by slugs. Hostas are used mainly for their foliage in different colors from blue to green, including variegated forms. They have lanceolate to spatulate and round leaves (from one inch to as much as one foot wide). The flowering period of the numerous species and varieties extends from June 15 until frost. The flowers are lavender or white.

Tiarella wherryi is a fine plant for a shaded rock garden or a naturalistic planting. The foliage is about six inches high, and the pale pink flowers reach a height of ten inches about May 20. *T. wherryi* does not creep as does *T. cordifolia*. It grows best in a humus or peat soil of adequate moisture and is little troubled by diseases or insects.

Filipendula hexapetala flore-pleno is a perennial with fern-like leaves; it produces airy white flowers about June 1. This plant, which is well adapted to the border and rock garden, grows

The airy white flowers and fern-like leaves of *Filipendula hexapetala flore-pleno* add a nice touch to a perennial border or a rock garden.

about twelve inches tall in full sun and about twenty inches tall in shade. *F. hexapetala flore-pleno* does best in a soil of moderate organic and moisture content, but will tolerate light soil and dry spells.

PERENNIALS (from page 172)

this plant up to that of the hybrid French clematis, and this improvement, coupled with the natural stamina and quality of the original plant, make it a "must" for anyone with an arbor for climbing plants.

Two beautiful hybrids of cytisus or Scotch broom, called 'Hollandia' and 'Zeelandia', have been produced in Holland. These are just coming over to this country, and because of the problems of re-establishing the stock plants here, may not be available for some time. They have been raised by a planned program of plant breeding in Boskoop and would appear to be completely hardy and a real "break" in color and form. They are red with an orange keel.

This spring was particularly fine for rhododendron flowering, and I took advantage of the opportunity to see some of the large established blocks of test seedlings growing here in the East. I was truly astonished at the quality of some of the finer plants. Some had beautiful peach - and - apricot - colored flowers, with trumpets almost as large as those of a lily; others had very full trusses of apricot-colored trumpets, deeply fragrant, and with an outstanding quality found in few plants of such size. Then there are the Shammarello Hybrids raised by A. M. Shammarello of Cleveland, Ohio, who has concentrated on the production of hybrids from 'Cunningham's White', 'Boule de Neige', and the native *R. catawbiense*. His breeding program has resulted in a wide selection of early, midseason, and late-flowering hybrids of compact form. These are particularly fine, and from the hundred or so numbered plants now being tested I can confidently state that probably twenty-five or thirty really outstanding plants will ultimately become generally recognized. One hybrid in particular struck me forcibly this spring. It has been named 'Belle Heller', and is a strong-growing rhododendron with an excellent constitution and very large trusses of creamy white flowers with a bright yellow throat. That there are other rhododendrons of this same description I am well aware, but I doubt whether there are any with the hardiness that these plants have.

While they are waiting for the newest plants to be distributed, may I suggest that my readers inquire of their local retailers for some of the new and better plants described above. None of them will prove a disappointment!

A Country Housewife's Garden

By **Gertrude B. Foster**

Mrs. Foster is Editor of
THE HERB GROWER MAGAZINE

IT IS STRANGE that anyone would want to photograph coriander, *Coriandrum sativum*, for a television commercial. The herb has been known in the food trade for centuries, but it is little grown in home gardens. The slim plant bears round green fruits which later turn light brown when ripe. All parts of the green herb have a strong pungency which is considered disagreeable to American senses. The ripe seeds, however, become pleasantly aromatic when dried. The loose umbels of pink-

(Continued on page 188)

CONSERVATION AND USE OF WOOD CHIPS

By Homer L. Jacobs

The following is based on the talk that Mr. Jacobs, Vice President of Research and Development of The Davey Tree Expert Co., gave at the thirty-fifth National Shade Tree Conference.

Balled trees are assembled in specially constructed bins. These are being filled with wood chips. Photo taken in 1955 at the Davey Technical Service Center in Kent, Ohio.

THE VALUE of humus, or other organic materials is too well covered in literature on soil improvement to be given further attention in this discussion on the conservation and use of wood chips for mulching and for incorporating directly into the soil. In what I have to say, there is no intent to disparage any commercial form of humus. All are good, and in an expanding — exploding — humus-starved "Levittown" culture, all available materials should be used.

Paul F. Frese in a handbook on mulches (*Plants and Gardens,* Vol. 13, No. 1, Spring 1957) lists twenty-two organic materials for this purpose. At least half of these are commercial materials, some produced for nearby sale only, while some, such as peat moss, are often sold at great distances from the point of production. Other organic materials could be listed; also such products as asphalt emulsion, cellophane flakes, plastic film, gravel, glass wool, and vermiculite.

Wood chips are the tree-man's product, and many thousands of cubic yards of this usable organic material are piled up each week from the four thousand or so wood chipping machines that are in operation in the United States and Canada.

A number of superintendents of parks, of botanic gardens, and arboretums, and those responsible for the planting and care of trees along city streets use large quantities of this by-product of tree-removal for mulching and soil improvement. But consideration should be given also to its use in home gardens, on larger landscaped areas, and in nurseries.

No great amount of technical information is available on the properties of wood chips in soil improvement. Most of the information on wood fragments is found in literature on the use of sawdust. F. E. Allison and M. S. Anderson in their *Use of Sawdust for Mulches and Soil Improvement* (U. S. Dep. Agr. Circ. 891. 1951) state, "Although the emphasis is on sawdust, this material differs little from other wood wastes, such as chips, shavings, and bark, except that decomposition is more rapid in the more finely divided materials and the absorbing power, when sawdust is used as a bedding, is higher." And again, "Since the percentage of bark, buds, and leaves in tree-pruning chips is often high, nutrient content is likely to be a little higher than that of sawdust."

A. A. Lunt in *The Use of Wood Chips and Other Wood Fragments as Soil Amendments.* (Conn. Agr. Exp. Sta. Bull. 593. 1955) brings the subject more nearly up-to-date and adds some basic information on the composition of wood chips.

Authors of literature on the agricultural use of sawdust and other wood wastes find it necessary to dispose of two popular misconceptions about these materials: one, that wood fragments incorporated in the soil are "toxic" to crops planted in the mixture; the other, that sawdust "sours the soil."

There is a little evidence that walnut and cedar wastes at times have some harmful effects on other plants. However, the general fear of toxicity results from the severely depressed growth that follows mixing sawdust or wood shavings into the soil without adding enough nitrogen to supply the crop, and to nourish the fungi and bacteria that are active in the decomposition of the woody material. It is recognized that mixing sawdust into the soil temporarily depletes the supply of nitrogen available to the crop. Lunt found that when supplemented with sufficient nitrogen, wood chips did not decrease the first-crop yields and generally increased yields of succeeding crops. This has been the general experience of others using sawdust or wood shavings.

Allison and Anderson point out that while most kinds of sawdust are mildly acid, this is generally of minor importance; when applied to acid-requiring plants, such as blueberries and azaleas, this slight acidity is beneficial. They further state that the final effect on soil reaction is negligible but is actually toward alkalinity. We all realize this when we remember that wood ashes are alkaline and that completely decayed wood retains about the same elements as those found in ash.

I tested screened material from a bed of chips two feet deep established in September 1955. Nitrogen fertilizers, usually acid-reacting, were applied from time to time and fresh chips were added once or twice a year to maintain the two-foot level. These screenings, representing the wood in the most advanced stage of decay, had a reaction of $pH_{6.6}$ in July 1959.

In the last seven or eight years I

have used some two thousand cubic yards of wood chips on plants under my care. Some of these have been used as mulch on shrubs and trees at the Davey Technical Service Center in Kent, Ohio, on soil that is quite sandy and exceptionally well drained, both on the surface and underneath. I have used fresh chips as a mulch in shrubbery borders and beds consisting chiefly of azaleas on my own home grounds. A heavy mulch was used on new tree plantings in a less well-drained clay soil, a few miles from Kent. In all these places, the chips appear to serve adequately the customary purposes of a mulch: to prevent extremes of soil temperature in the upper layers; to prevent compacting and facilitate the entrance of moisture; to conserve moisture by preventing surface exaporation; to discourage weed growth.

Park superintendents and others who use large quantities of chips for soil improvement report on composting them with soil and other amendments to prepare them as an enriched planting medium. Grape growers of Hammondsport, New York, used eight thousand tons of maple chips on the eroded, worn-out soil in their vineyards. Broadcast over the land at the rate of twenty tons or more per acre, the chips were later plowed into the soil, with the addition of one hundred and fifty pounds of ammonium nitrate per acre. During a four-year period production increased to as much as "seven tons of grapes per acre from vineyards that once hardly produced a ton per acre."

Use of wood chips at the Technical Service Center in Kent proves that not only do the raw chips as they come from the chipper provide a medium in which tree-moving stock can be held, but one in which trees can be grown for years — with no additions other than supplemental nitrogen, water as needed, and the control of high temperatures as to be described later.

Before the growing season of 1955, a few balled trees were assembled on the Davey Technical Service Center grounds. In September 1955, another seventy-five trees were accumulated in the same area. Other trees have been brought in at irregular intervals to a total of about one hundred and eighty specimens. Fifty remained in place in July 1959. To receive these trees, large bins were formed of 8 x 8 x 16 (inches) concrete blocks, spaced eleven inches apart and three blocks high. This made walls twenty-four inches high with many openings, yet sufficiently solid to retain wood chips. The trees were set in the enclosed area and chips filled in around them as they were delivered. Fresh chips were added from time to time as the bulk was reduced by decay. The surface on which the trees were set was a graveled parking lot with slope sufficiently uniform that the area was well drained.

Thirteen kinds of trees have been held in this way for varying intervals of time during five growing seasons. Trees considered both easy and difficult to transplant have been included: red, sugar, and Norway maples; pin oak; littleleaf and Crimean lindens; American mountain-ash; American holly; sweet gum; shagbark hickory; Chinese chestnut; European beech; and flowering dogwood.

As the trees have come and gone at irregular intervals, it has not been possible to keep as complete record of individual trees as might have been done in a purely research project. Some of the trees have remained for only three weeks. On the other hand, one red maple and two four-inch American hollies are in their fifth growing season in a pure wood-chip medium.

It has been observed that trees which remained in the stockpile throughout the first or second growing season were in a condition fully as good or better than would be expected of similar trees transplanted for the same length of time in permanent locations.

It is, however, in the root development that the results of using wood chips are remarkable. Much, perhaps most of the success of transplanting is due to this root growth. (It has been relatively easy to see and photograph some of this root growth.) Large trees that normally transplant poorly have made root growth in these chips as abundantly and of as fibrous a nature as that produced by red maples or American elms. This was illustrated clearly by the root response of two four-and-one-half-inch shagbark hickories moved to the stockpile in the fall of 1957. In the fall of 1958, each tree was carrying healthy foliage, had made normal twig growth, and had produced great strands of fibrous roots, three feet or more out from the original ball.

Piles of fresh chips, with or without leaves, heat rapidly for a time even

After it had been in the bins of wood chips for two months, this Crimean linden, *Tilia euchlora*, was lifted in mid-July with a mass of new roots throughout the depth of the ball. Rootlets turn burn in the first-grown older portions; the white brittle tips indicate the actively growing, absorbing portions.

Root growth on a sweet gum, *Liquidambar styraciflua*, which was covered with chips from September 25 to the following May 11, was well started before the leaves developed. The tree prospered in its new permanent location.

without nitrogen and water added. This heat may build up quickly to a degree dangerous to roots and, consequently, to the survival of the tree. If no provision can be made for heat control, fresh chips should not be used in layers deeper than six inches or eight inches, even as a mulch. Where heat control is not feasible, the heat resulting from decay should be allowed to run its course in the unused pile.

Roots of shade trees probably grow best at temperatures of 60° to 80°F. The danger point is reached at 90° to 95°. I feel sure that at soil or chip temperatures of 100° to 125°, roots of most shade trees will die. I have found in a bin of fresh chips leveled off three feet deep, temperatures of 129°, 139°, and even 144°, twelve days after the bin was filled.

Heat may be controlled by making large punchbar holes a foot apart, all the way through the chips, by watering heavily, or by a combination of both. In one large bin which I have under observation (ten months after it was filled), it is necessary to turn the sprinkler on over the bin for twelve to fifteen hours once or twice each week to keep the temperature below 90°. If nitrogen is added to beds which are two to three feet deep, heat increases even more rapidly.

With added nitrogen and water this heating will continue well into the second year. The problem of dangerous heat and its control must therefore be kept in mind. However, this heat, controlled as described, made it possible for trees in the Kent stockpile to produce new root growth during the fall and winter months, well in advance of the time when new leaves would be demanding water and nutrients. Species that are most easily transplanted in large sizes are those that make new roots most rapidly and profusely after the transplanting. This has been true of these stockpile trees.

Roots and what makes them grow have fascinated me during my thirty-seven years with the Davey Tree Expert Co. Consequently, it is intriguing to consider the possibility of manipulating and using the heat latent in chips to keep the soil around transplanted trees warm through the winter, so that the new spring growth may have a fine new root system to support it and to keep it thriving without any lag through the first summer. Tree roots do not remain dormant just because the buds are dormant. I have kept roots growing all winter by wrapping thermostatically controlled hotbed heating wires in the fillback around them.

Fall-set maples in moist, warm, well-aerated wood chips extended new roots eight inches into the fillback in only five weeks. A sweet gum, placed in the bin in September, had sparse but healthy new roots three to four inches long when removed the following May.

Wood chips are too useful for tree men to throw away, and we should more fully inform home gardeners, landscape gardeners, nurserymen, and others about conserving and using this by-product of tree service. We should also encourage research by the plant pathologist, the scientific horticulturist, and the economist on these questions:

Are insects and more particularly fungous diseases transmitted by wood chips? What is the moisture-content, the weight-volume relationship? What, if any, are the chemical and biological differences between chips produced during different seasons of the year? What is the optimum amount to satisfy nitrogen requirements under varying conditions? How do wood chips compare with other products as mulch and soil amendment? What can be done in drying, regrinding, and packaging wood chips to make them more attractive and practical for the home gardener?

The combed-out root system of a four-inch sugar maple, *Acer saccharum*.

MOLECULES (from page 166)

of the particle is the infectious principle, and it probably is intertwined in a cylinder of protein as a spiral coil. It can be removed from the protein which is then non-infectious, but infectivity can be restored by recombining the two bodies.

Other viruses, such as the southern bean mosaic, have an entirely different shape and arrangement of their components. As in tobacco mosaic, the virus consists of protein and a ribonucleic acid. The protein occurs as a shell about 50 Å thick around what has been generally considered to be a spherical body but is more likely an icosahedron. The center of the particle is a ball or

sphere of nucleic acid about 200 Å in diameter. The protein consists of sixty identical units, each with a molecular weight equivalent of approximately eighty-five thousand. Each of these units consist of three strands.

Apparently these nucleoproteins have the capacity to subvert or alter the ordinary biochemical processes of plants. The hereditary mechanism of plants is believed to be carried in the deoxyribonucleic acid (DNA) of the chromosomes. These acids apparently have the capacity to regulate the synthesis of the proteins essential for enzyme systems. It is conceivable that the ribonucleic acids of the virus either interfere with the normal ribonucleic acids of the cell or change the process of the deoxyribonucleic acids. In any event, the physiological processes that are normally regulated by hereditary processes are subverted into abnormal channels to give disease. The symptoms are not due to wasted effort in the abnormal synthesis of virus protein.

The Design of Biologically Active Molecules

Tremendous strides have been made in the last twenty years in the regulation of plant growth by organic molecules synthesized in the laboratory. We know how to stimulate roots, thin flowers, prevent fruit drop, and inhibit sprouting of buds by chemicals. It is possible to destroy selectively one plant but not affect another. In the twenty years since Dr. P. W. Zimmerman and Dr. A. E. Hitchcock discovered the selective hormone activity of 2,4-D, a new industry in selective herbicides has grown and expanded. Closely allied with this upsurge in regulation of plant growth has come an equal revolution in development of fungicides, insecticides, nematocides, soil fumigants.

All these advances in pest control have come through similar channels in exploiting organic chemistry. The general principles behind the design of a molecule for selective activity are very similar in all fields. The molecule must be designed so it will penetrate a living cell and the protective layers over it, move to the site of action, enter into chemical reaction with one or more cell constituents vital to some essential function, avoid entering into extraneous reactions that would detoxify the molecule before it could perform its assigned task, and not present a hazard to the consumer of the produce by leaving harmful residues or toxic reaction products.

The penetration of the waxy cuticle, the cell wall, and the cell membrane that give the protoplast its integrity, calls for a very delicate balance between the hydrophilic and lipophilic properties of the molecule, that is the ability to dissolve in water and in oils or waxes. Usually a relatively long carbon chain or ring structure, such as a parachlorophenyl structure, is added to the molecule to enhance solubility in oil. This is balanced by a polar group, such as a hydroxyl or carboxyl group, that has an affinity for water. With these balanced attributes, the molecule has a chance to penetrate progressively through the cuticularized or waxy outer layers of the cell, the protein layer of the cell membrane, the lipid layer of the cell membrane, and the aqueous medium of the cytoplasm to the site of intense physiological activity—as the enzyme system of the mitochondria.

The molecule must have a chemically reactive group which can become affixed to vital cell metabolites or enzyme systems. This may be the double bond in a quinone fungicide, the carboxyl group in a plant regulant, the nuclear halogen on the cyclic structure of a triazine, or the metal-chelating groups of a hydroxyquinoline. The great difficulty with most organic molecules is that they are too reactive, that is, too prone to react with many cell constituents, which leads to severe waste of the limited amounts of materials that penetrate into the cell cytoplasm. For example, Dr. Lawrence P. Miller and Dr. S.E.A. McCallan have shown, by use of radioactively labeled glyodin and other molecules, that the organic fungicides have tremendous capacity to penetrate fungous spores (up to 6500 p.p.m. in a couple of minutes), but tremendous doses of many compounds (6500 to 20,000 p.p.m. of the spore weight) are required to destroy the spore.

Sometimes the molecules are broken down or detoxified by the cell that they are supposed to destroy. Houseflies that have acquired resistance to DDT have developed a new enzyme. This is a dehydrochlorinase that removes a molecule of hydrochloric acid from each molecule of DDT and renders it innocuous. The DDT molecule can be changed to an analogue that prevents this enzymatic dehydrochlorination. The analogue will kill resistant houseflies until a strain develops another type of resistance.

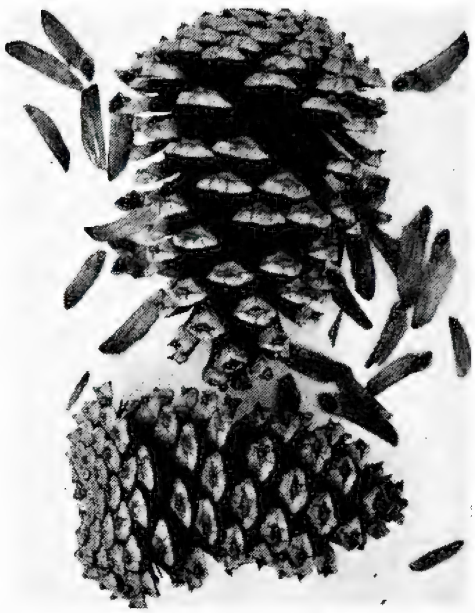
The metabolism of molecules in the living cells has been exploited to develop secondary products that are safer or more selective as herbicides. For example, if the acetic acid group in the herbicide 2,4-D is replaced with a butyric acid group, the new compound will not injure alfalfa and certain other legumes as does 2,4-D. However, if the alfalfa field has wild mustard growing in it, this very harmful weed will be killed, because it has an enzyme (*b* oxidase) that removes two carbon atoms from the harmless butyric derivative and converts it into 2,4-D. The mustard has, in one sense, committed suicide while the valuable alfalfa does not have this capacity.

The Future Is Promising

When we consider the intricacies that are involved in the regulation of a plant's physiology by a virus — for example, where the regulant multiplies even as it circumvents the hereditary mechanisms — we can see that the chemists have much larger assignments ahead of them. There is no earthly reason why new wonders will not be created in the next thirty years which will completely overshadow the achievements of the past.

As man learns about the behavior of molecules inside the living cell, confidence grows that he can control the living forces to whatever end he desires. The possibilities are limitless, bounded only by the creativity of the human brain. With patience and diligence in unraveling the mystery of the living cell, man should be guided into creating new and useful molecules.

Men and plants have come a long way together through the pages of history. What started out as the collection of a quick meal or the nibbling on a choice fruit during an interlude in the hunt for game has evolved into a full partnership. Neither the society of man nor that of plants can flower into full maturity without the other. The development of a sound understanding of molecules in the life of a plant is the open roadway toward the maturity of this partnership.



The reforestation story begins with the pine cone and its winged seeds. Pictured here are the cones and winged seeds of loblolly pine, *Pinus taeda;* a bushel of these cones yields about three-fourths of a pound of clean seeds. A pound of seeds will produce about seventy-five hundred plantable seedlings which will reforest about seven and a half acres.

REFORESTING THE TENNESSEE VALLEY

By **J. O. Artman**

Mr. Artman has worked with the Tennessee Valley Authority for over twenty-five years and is now Staff Forester in the Director's office, Division of Forestry Relations. He attended the Pennsylvania State Forest School at Mont Alto and was graduated from North Carolina State College School of Forestry in 1931.

THE Tennessee River drains a twenty-six-million-acre valley stretching from the Appalachian Highlands of Virginia, North Carolina, and Georgia, westward across Tennessee, northern Alabama, and Northeast Mississippi to a juncture with the Ohio River in southwest Kentucky. Until DeSoto penetrated the middle portion of the Tennessee Valley about 1540 and for almost two hundred years after, this was the citadel of the Cherokee Nation. French traders, working upstream from the Mississippi, built a few trading posts along the lower reaches of the Tennessee early in the eighteenth century. The British established Fort Loudoun on the river below Knoxville in 1756; and although the Cherokees soon drove them out, it was the British who wound up with control of the Valley after the French and Indian War of 1760.

The main settlement route for this part of the country was out of Virginia, down the north and south forks of Holston River. Other settlers came out of North Carolina, across the mountains and down the Watauga, the Nolichucky, and the French Broad. Knoxville, one of the early settlements, was named the capital of the Territory South of the Ohio in 1791. The Cherokees, outnumbered, outfought, and outvoted, were forced to move west of the Mississippi in 1838. Only a few managed to escape the forced migration, and today the descendents of these few live on the sixty-four-thousand-acre Qualla Reservation in North Carolina, just south of the Great Smoky Mountains National Park.

The Tennessee Valley of the Cherokees was forested for the most part; and what a forest it must have been! Descriptions by the elder Michaux, dating back to 1787, paint vivid pictures of this age-old forest community. The patriarchs included hemlocks seventeen feet around at the base, yellow poplars twenty-six feet in circumference, dogwoods five feet, and shellbark hickories twelve feet. Today we catch just a faint glimmer of this grandeur in the Joyce Kilmer Memorial Forest bordering Little Santeetlah Creek in Graham County, North Carolina, where yellow poplars thirteen feet in circumference tower almost a hundred feet to the first limb.

But this thing of beauty and value from our vantage point was an obstacle to pioneer progress. The forest had to give way to agricultural and industrial development. Half the land in the Valley was eventually cleared, and the cream of the timber crop was skimmed off the other half. Lumber production at its peak about 1909 was almost twice what it is today. Since then the forests have been cut and recut, burned and reburned, and only today is the exploitation trend being reversed.

Despite the fact that fifty-four per cent of the land area of the Valley is still classified as forest land, foresters and agriculturists agree that another one and a half million acres of open land should be reforested. Some of this land is eroding, some is used inefficiently for agricultural crops, and some is idle. On the basis of present-day judgments, it is best suited to timber production.

By comparison, the area reforested in the Valley over the past quarter-century totals 502,300 acres. I do not mean to belittle this progress. Persuading fifty thousand landowners to plant five hundred and twenty-one million seedlings on half a million acres of eroded, idle land is no small accomplishment. But in relation to the total job, and in view of estimated future needs for wood, progress has been discouragingly slow. As in any undertaking, evaluation is a matter of where you stand and the direction in which you look.

First let us look back. When Congress created the Tennessee Valley Authority in mid-1933, the TVA Act made special reference to the glaringly obvious erosion problem. Land had been cropped to death, abandoned, and left to the ravages of nature. Early estimates put the seriously eroding area at something like three million acres, with another seven million acres affected to a lesser degree. In the whole watershed, no more than three thousand acres had been planted to trees. Individual landowners lacked the initiative and know-how to do anything about the gullies that were eating away their real estate.

Since the states at that time had no facilities for mass-producing tree seedlings, TVA established two forest nurseries — one near Clinton in eastern Tennessee and one at Muscle Shoals in northern Alabama. From 1935 to 1942, during the Civilian Conservation Corps era, these two nurseries produced about one hundred and forty-nine million seedlings, and the CCC boys planted them to reclaim 115,300 acres.

Our objective in those early days was to put on public display thousands of small plantations in order to demonstrate that trees would control erosion and put idle land back to work. We made it as easy for the landowner as possible. About all he had to provide was the eroded land and permission for the CCC boys to control gullies and plant trees. As interest grew, he was asked to provide teams and such

These two pictures record eleven years of progress in the Copper Basin, a twenty-five-square-mile area in southeastern Tennessee where copper smelting a hundred years ago destroyed practically all vegetation. The top picture was taken in October 1944; the bottom in November 1955.

materials as fencing and straw for mulching. When the CCC program came to an end in 1942, he had to do his own planting. And beginning in 1957, seedlings were no longer free; he had to pay the going state price.

This gradual stiffening of the program is in itself a good barometer of progress. It was not easy in the early days to persuade landowners to accept this erosion control and tree-planting service, even though it cost them nothing. I recall one incident when there was a mix-up in boundary lines, and the CCC boys planted a couple of acres on the wrong farm. The farmer involved in this unintentional trespass was highly indignant and insisted that every last pine "sprout" be pulled up. Of course, he felt somewhat different eighteen years later while he watched his neighbor thin his planted pines, which by that time contained two hundred dollars worth of pulpwood per acre.

Fifty Thousand Tree Planters

We estimate that some fifty thousand Valley landowners have planted trees. And we believe this means a potential fifty thousand converts to the conservation idea. Planting trees is not a great task; almost anyone can do it. This makes it a valuable first step toward forestry. But more important, it is a powerful mind conditioner that normally leads to other constructive conservation actions.

For example, the man who invests time and money in planting trees usually becomes forest-fire conscious. He has an investment to protect, so he is more careful with fire himself, and he cautions his neighbors to be careful. Planting and tending a plantation of trees also stir interest in other forest land. The landowner who has done little to improve the forty or fifty acres of woodland he already has is prompted to take another look at that land when he plants trees. Then too, there

This area in southwest Virginia, that had been stripped for coal, was put back to work growing shortleaf pine, *Pinus echinata*.

is something deeply satisfying in watching trees reclothe a barren hillside with productive and protective vegetation. It is good for the soul.

But don't misunderstand—all is not altruism and sentimentality. There is an economic side to this tree-planting business, too. And in the last analysis, I suspect it is the economic consideration that really counts.

Here in the Valley the principal species that are being planted are loblolly and shortleaf pine, with some eastern white pine at higher elevations. Growth is such that seven to ten years after planting the trees are big enough to be used for fence posts and ready for a first thinning. In another five to ten years they can be thinned again, and this time the major product is pulpwood. Additional thinnings at about seven-year intervals yield more pulpwood, some poles, and a few sawlogs. At forty to forty-five years from planting, the remaining trees are mature and ready for final harvest.

From measurements on experimental plantings we estimate that an acre of loblolly pine, planted on a good site and managed intensively over a forty-three-year period, will yield seventy-three-hundred cubic feet of wood worth three thousand dollars in the form of posts, pulpwood, poles, and logs. Shortleaf pine, over the same period, can be expected to return seventeen hundred and fifty dollars per acre on a fair site and about fourteen hundred and twenty dollars on a poor site.

If we apply a conservative products-value of fifteen hundred dollars to the half-million acres already planted, it means this brand new resource has a potential raw-material value of about seven hundred and fifty million dollars. And that's not all. To this tangible products-value we can add the intangible, but nonetheless very important, side-benefits of watershed protection, food and shelter for wildlife, and outdoor recreation.

Costs in relation to benefits are almost insignificant. Planting costs, including trees and labor, average about thirteen dollars per acre, and, in most cases, this is the only cost involved. Sometimes one must spend additional money to protect the young trees from fire and livestock, but this is the exception rather than the rule. Land purchase is not usually a factor, and taxes are paid regardless of use or disuse. So a thirteen-dollar investment in an acre of pine will return fifteen hundred dollars and perhaps as much as three thousand dollars over a period of forty to forty-five years, which isn't bad at all.

Earliest Planting

The first record of tree planting in the Valley dates back to about 1890 when Gifford Pinchot was working at Biltmore, George W. Vanderbilt's estate near Asheville, in western North Carolina. Pinchot, just back from the French forestry school at Nancy, was America's first native-born forester, and Vanderbilt was the first American landowner to employ a forester. Pinchot was followed at Biltmore by an imported German forester, Carl A. Schenck. These two men together planted somewhere between one thousand and three thousand acres before 1912, using some forty species of hardwoods and conifers. Their method included both direct seeding and the planting of seedlings, some of which they grew in their own nursery.

The Valley states first became interested in reforestation about 1915. But the few state foresters employed in those days were fully occupied in fighting fire. There was little time or money for anything else. Public interest in tree planting was still dormant. As a matter of fact, a man would have been considered lacking in common sense to have planted trees in an area where fire burned a million acres each year. One or two states had established small nurseries, but total production before 1933 was less than two million seedlings.

In sharp contrast, the seven Valley states in 1959 produced over five hundred million seedlings in state nurseries. Valley landowners planted almost seventy-five million seedlings to reforest 85,270 acres. Over the past five years they have averaged over forty-four million a year, almost three times the average for the 1950-54 period and four and a half times the 1935-39 average.

The big spurt in seedling production by the states occurred about 1956, when Federal funds for nursery expan-

Each year for five years TVA nurseries were systematically combed for superior seedlings — seedlings that were definitely faster growing than the average. This loblolly seedling, only five years from seed, is already twelve feet tall.

NEW — as of September 1, 1960

HUSBAND AND WIFE MEMBERSHIP

$15 a year

Responding to numerous suggestions —
the Garden's Board of Managers has inaugurated this new membership category.

Membership cards will be issued to both husband and wife.

Discounts on tuition fees will apply to both. Both may ride the Floral Flyer without charge. Free parking for either.

* * *

For other membership changes, see article in this issue, page 193

NONE OF THE CHANGES WILL AFFECT EXISTING MEMBERSHIPS UNTIL THE END OF THE PRESENT MEMBERSHIP PERIOD.

ALL Members —

note information on FREE PLANT DISTRIBUTION within this special insert

THE NEW YORK BOTANICAL GARDEN
PLANT DISTRIBUTION TO MEMBERS

October 18th and 19th.

The New York Botanical Garden has available for distribution to its members a limited number of small plants of two interesting hardy shrubs. These plants are:

Rosa omiensis pteracantha

(A) *Rosa omiensis pteracantha* is a native of western China. It is a hardy deciduous shrub, at maturity six to ten feet high and as much in diameter. It can be maintained at a smaller size (four to five feet high and about the same in diameter) by judicious pruning. It is of graceful habit, has fine-divided, fern-like foliage and white four-petalled flowers (most wild roses have five-petalled flowers), one to one and a half inches across. The flowers are followed by red, pear-shaped fruits. A most attractive feature of this variety is the very prominent blood-red, transluscent spines that decorate the first-year shoots. In winter these are notably conspicuous, especially when viewed against the sun. For this reason a location where the shrub can be observed under these circumstances is recommended.

Rosa omiensis pteracantha thrives in any ordinary fertile garden soil that is well drained and in full sun. It is pruned by cutting out as many of the old shoots as can be spared, either in spring (this sacrifices flowers but assures the maximum development of young shoots with colorful spines) or immediately after flowering. Propagation is readily effected by cuttings.

Salix humilis

(B) *Salix humilis,* the upland willow or prairie willow, is a native of eastern North America. It forms a broad, spreading, hardy shrub, five to seven feet high, with many tortuous branches which root into the ground. From these horizontal members arise numerous erect branches which bear the flower catkins ("pussies") in early spring before the leaves appear. The plant we offer is staminate (male). Its catkins, which are borne profusely, are predominantly cream-colored with a golden anther tipping each stamen. The grayish green foliage has no outstanding merit. The prairie willow thrives in any ordinary soil in full sun. While it needs no regular pruning, provided it has sufficient space in which to develop, it may be restrained and kept within modest bounds by cutting out old and unwanted shoots immediately after flowering. It is readily propagated by cuttings.

HOW TO GET THEM: Members of the Garden who desire these plants are requested to present the accompanying ticket on *October 18th or 19th between the hours of 10:00 a.m. and 4:30 p.m.* at the Sales Counter in our Main Conservatory Range (the large greenhouses near the Museum Building). As long as the supply lasts, each ticket will entitle its bearer to one specimen of each of the two plants.

Members who cannot call at the times indicated may have the plants shipped to them. Packing and shipping will be done under the direction of our Horticulturist. Even with the best attention in this respect damage sometimes occurs before plants reach their destinations and there is no doubt that it is better for members to arrange to pick up the plants at the Garden if they can do so. Orders to be mailed will be sent as soon as convenient, which may be before or after October 18th and 19th.

The number of the above plants available for distribution is limited and it may not be possible to fill all requests. The New York Botanical Garden does not recommend shipping plants outside the Japanese Beetle Quarantine Zone.

If you cannot come and wish to have the plants mailed, sign and return the ticket promptly, together with one dollar and the accompanying shipping label (please write the name and address to which you wish the plants to be shipped on this). Address requests to Plant Distribution, The New York Botanical Garden, Bronx Park, New York 58, New York.

SHIPPING LABEL

See other side for ticket

Cut on this line

From
The New York Botanical Garden
Bronx Park, New York 58, N. Y.

CONTENTS: Merchandise. Package may be opened for inspection.

For

Name .....
(Please Print)

Street Address .....

City .....Zone No. ..... State .....

Cut on this line

184C

THE NEW YORK BOTANICAL GARDEN

Ticket for Plant Distribution - October 18th and 19th, 1960

The presentation of this ticket properly signed at the Sales Counter in the Main Conservatory between 10:00 a.m. and 4:30 p.m. on either of the above dates entitles the bearer to one specimen of each of the two plants being distributed as long as the supply lasts.

Signature of Member .....

Address .....

PLEASE BE SURE TO SIGN AND BRING OR SEND THIS TICKET WHEN APPLYING FOR THESE PLANTS

sion became available through the Soil Bank program. Before that time practically all of the seedlings planted in the Valley came from TVA's two nurseries. Now well over half come from state nurseries; and because state production is catching up with demand, our Muscle Shoals nursery was closed this year.

Cooperative Effort

Reforestation in the Tennessee Valley is a function of the state forestry agencies, just as it is elsewhere in the country. Within each of the seven Valley states, the state forester is the project leader. TVA's role is one of cooperating, coordinating, integrating, and supplementing. We have done much of the required investigation in cooperation with the United States Forest Service experiment stations. Our one nursery still in operation helps state nurseries meet the demand for seedlings and at the same time serves as a pilot plant for developing and testing new nursery techniques. Our foresters are taking an active part in improving planting stock, developing the art of pine grafting, searching out specimens of superior pines, and establishing orchards of grafted pine for the production of high-quality seed. We have recently begun a comprehensive study of fertilizers as they may apply to tree planting and the other forestry activities. And here we are backed up by TVA chemical engineers and agriculturists with their vast experience in fertilizer research and development.

The agricultural extension divisions of the land-grant colleges have also been active participants in reforestation. County agents have been largely responsible for selling the tree-planting idea to farmers and helping them decide which lands to plant. They have encouraged civic groups and banks to purchase tree-planting machines and

(Continued on page 191)

Top. Farmers in Henderson County, Tennessee, take time to learn how to control erosion and plant trees.

Center. Students of a vocational class in agriculture at a Virginia high school learn how to plant trees and at the same time install a backdrop for a new recreation field.

Bottom. Clinton Nursery is a favorite with touring school groups. Here a group listens attentively while the nursery superintendent explains how seedlings are produced.

ECHOES OF THE PAST

The New York Botanical Garden and Bedford Chapter 882 of the Agassiz Association

IN DISPOSING of the home occupied for a number of years by Miss Eloise Payne Luquer and her brother, for the executors of the Luquer Estate, William Kemble of Bedford, New York, was able to salvage a few articles from the library. One of these was the minutes book of the Bedford Chapter 882 of the Agassiz Association. In looking over its yellowed pages, Mr. Kemble noticed the report of a field meeting of the Torry Botanical Club held at Bronx Park on October 19, 1895.

The report was in Miss Luquer's handwriting. She was then the Chapter's Secretary and deeply interested in botany and conservation. She made the first nature trail for the Bedford Garden Club in the Ward Pound Ridge Reservation — in fact, she is credited with having been the originator of nature trails. The Garden Club of America presented its Conservation Medal to her and in 1950 established the Eloise Payne Luquer Medal in her memory. It was awarded in 1957 to Dr. William Jacob Robbins, then Director of The New York Botanical Garden, for medical research in botany.

Mrs. Edwin De T. Bechtel, another friend of The New York Botanical Garden, read Miss Luquer's report of the field meeting and suggested making it available to the Editor of *The Garden Journal.*

Mr. Kemble, however, did more than this — he entrusted the precious minutes book to the Editor since he found, on further reading, a number of references in it to the Garden. These are reproduced below.

Eight people, including the Rev. and Mrs. Lea Luquer and their daughter Eloise Payne, met on July 1, 1887, to organize a chapter of the Agassiz Association. They agreed to meet at the residence of Brenton Boggs, who was elected secretary, every other week (later changed to once a month). The first meeting was held at his home on July 6, 1887, when the charter of the new chapter was received from Prof. Harlan H. Ballard, President of the Agassiz Association.

Two years later, when Mr. Boggs moved from Bedford, Mrs. Luquer replaced him as secretary, and until her death in 1894 was one of the leading members of this small group of naturalists, "taking constant pleasure in the study of the beautiful things of nature." Her daughter Eloise Payne later held the office of secretary.

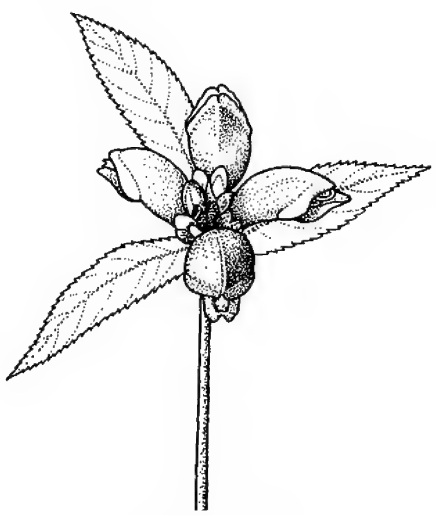
Papers on botanical, entomological, geological, and mineralogical topics were prepared for presentation at the meetings, and articles within these areas were read from such magazines as *Popular Science Monthly, Science News, Harper's Weekly, The Circle of the Sciences* (English), *Garden and Forest, Atlantic Monthly, American Naturalist, London Saturday Review.* "Lessons" were taken in botany, including plant identification, and entomology. The members of the chapter were especially interested in the Compositae, trees, ferns, mosses, lichens, and fungi. Wildflowers, mosses, fungi, insects, minerals, woods, shells, and seaweeds were exhibited at the meetings, and a collection cabinet was acquired to accommodate permanent displays.

August 17, 1887. "... Miss Luquer exhibited 25 specimens of fungi gathered in the parsonage woods, also a collection of wildflowers. . . ."

September 14, 1887. "Miss Keeler exhibited *Chelone glabra* (turtlehead) and *Spiranthes gracilis* (ladies' tresses) and other wildflowers. Mrs. Boggs exhibited fossil shells found in Beaver dam brook. . . ."

April 7, 1890. "... Dogtooth violets were shown by Miss Luquer. They were picked on April 6 along the Rectory brook. . . ."

February 13, 1891. "... Miss Bates added several specimens of wood to the collection now embracing about 60 pieces which were examined with interest. . . . Miss Luquer's collection of wildflowers of this township was examined. . . ."



Chelone glabra.

April 3, 1891. "... Mrs. Eastman brought a little bunch of trailing arbutus budded at Easter. . . ."

July 11, 1891. "A field meeting in the woods opposite Mr. [Gustavus] Kirby's house. Seed pods of many spring flowers were collected, particularly of a trillium and smilacena. Great quantities of *Pyrola* [*elliptica*] were found."

From the annual report of the Secretary of Chapter 882 to Prof. Harlan H. Ballard, dated November 10, 1891. "Our herbarium contains 120 specimens, besides grasses (30) and ferns (8) . . . we have secured 50 specimens from trees growing in our immediate neighborhood, which we have had to cut to show the bark and horizontal, vertical, and transverse sections of the trees. On one of our field meetings, the Society made itself very familiar with the foliage of these trees and, under skilled guidance, with the manner of growth of branches and leaves. . . ."

July 22, 1892. "The members . . . went for a walk and under the guidance of Mr. Bates explored a part of Old Pitch Swamp. The swamp being quite dry it was possible to penetrate a good way into it, and it was most interesting and beautiful. Several new species of ferns were found, and good specimens of *Habenaria psycodes* and *H. virescens,* two kinds of mountain mint, and of scutellaria. We admired the tall ferns — in places as high as our heads — and the sweet swamp azalea which was abundant in one part, and we formed an intimate acquaintance with nettles and catbriars." D. W. Marble, Secy. pro tem.

"Spring of 1893. The party under the guidance of Mr. Bates drove to Middle Patent, and from there walked through River Hills to the beautiful waterfall which was very full. Many interesting flowers — thick beds of violets, both blue and white, and large quantities of purple trillium being especially striking."

May 28, 1895. "The members met at Mr. Bates' and drove to Middle Patent, and from there walked to the beautiful waterfall in River Hills, and clambered down the rocks to the foot

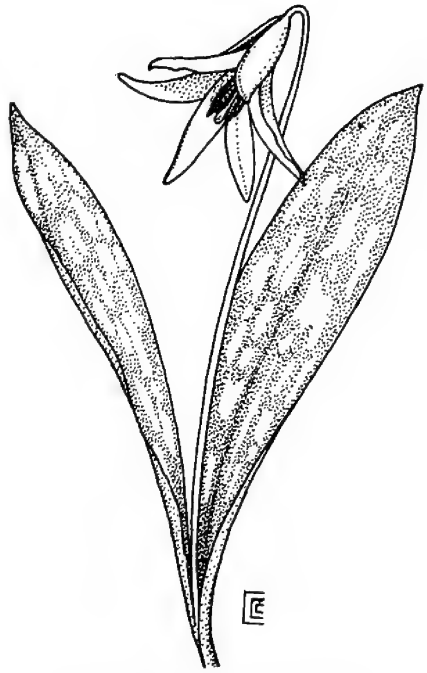
of the cascade, where it joins the Mianus River. Many interesting flowers were found, including a cypripedium, wild ginger, medeola, [and] broom rape. Mr. Luquer suggested that a name be given the waterfall . . . and it is now 'Moss Cascade'; a most appropriate name as the rocks over which the stream tumbles are covered with exquisitely green soft moss, making a beautiful contrast with the foaming white of the little cataract. . . ."

"On Saturday, October 19 [1893], Miss [Cassie M.] Bates, Miss Lena Wood, Miss Marion Wood and Miss D[elia] W. Marble joined the field meeting of the Torrey Botanical Club held at Bronx Park, with Prof. N. L. Britton as guide. The object of the meeting was to see the new Botanical Gardens, where work has just been begun.

"The party started from the Bedford Park station and conducted by Prof. Britton walked through that part of Bronx Park which has been reserved for the New York Botanical Gardens, [sic] an area three quarters of a mile long and half a mile wide, very diversified in character, containing a beautiful hemlock grove 40 acres in extent, a fertile open glade where the first furrows were being turned for the future nurseries, a tract of flat 'gravel bottom' near the river where it is proposed to lay out the systematic garden, and a 'flood level' of silt still nearer the river with swamps where aquatic plants can be cultivated.

"A large part of the garden is covered with fine woods, where some of the finest trees had already been marked with the labels of the Botanical Gardens.

"The old Lorillard House is in the midst of the Garden, although it is retained by the Bronx Park, not being needed for any purpose of the Garden. It is owing to the estate having always been in the hands of the Lorillard family that the trees, etc., are so perfectly preserved. The Bronx River, with a pretty waterfall, is a most attractive feature of the place. Two fine pot holes were pointed out, as well as numerous noteworthy trees, both native and cultivated. A fine specimen of [name omitted] was found, being native there, though never seen here by us, and *Aster tradescantii* was kindly identified for us by Prof. Britton, to our great enlightenment. Both Prof. & Mrs. Britton showed themselves most kind and ready to answer any questions, and the afternoon was instructive as well as delightful to us."



Erythronium americanum.

From the annual report sent to Prof. Harlan H. Ballard, November 17, 1896: "Last winter we began the study of mineralogy, using as a text book Prof. Dana's *Outlines of Mineralogy*. An instructive and entertaining lecture on some of the simpler methods of determining minerals was given to us by Ira McI. Luquer, Asst. Prof. of Mineralogy in Columbia College. We held a field trip to explore quarries near us, where feldspar and quartz are quarried for manufacture into porcelain. Good specimens of rose quartz, red and white feldspar, and mica were obtained; also oxide of manganese and tourmaline crystals. In the spring we took up again Prof. Wright's course on trees, using fresh specimens as far as possible for analysis study. The course on *Compositae* we finished during the winter. . . ."

March 23, 1897. ". . . The last half of the meeting was devoted to a study of the mosses, with the help of Mrs. Britton's articles in *The Observer,* the specimens, and such help as could be gathered from the plates in Gray's Manual and Prof. Sargent's book on Cryptogams. . . ."

May 19, 1897. "The party assembled at Mr. Bates' and drove to Middle Patent, and from there walked through the lane and wood path to River Hills waterfall. The path was carpeted with violets, among which *V. palmata* was abundant. The azalea was in bloom, and the woods . . . full of young ferns with half-coiled fronds. . . . With Mrs. Britton's help, thirty different species of mosses were collected which Mrs. Britton most kindly sorted and named for the chapter on the following evening. . . ."

May 20, 1897. "Mrs. N. L. Britton most kindly gave a lecture on mosses . . . called 'A Climb Up Whiteface,' . . . and was a delightful account of a day's tramp up this famous mountain with descriptions of the many mosses collected on the route. The lecture was illustrated by lantern slides showing enlarged drawings and sections of many species of mosses, interspersed with charming views of Lake Placid and Whiteface. After the lecture the audience examined the large collection of mounted specimens of Adirondack mosses which Mrs. Britton had sent, being part of the Columbia University Herbarium. . . ."

"No meetings were held in 1902."

"Several meetings were held in 1903."

"During 1904, 1905, and 1906 meetings were held at irregular intervals. But it should be recorded that this Society has competed for the prize offered by The New York Botanical Garden for the best collection of wild-flowers at the exhibitions of the Horticultural Society of New York [and The New York Botanical Garden], held in Bronx Park in May and June of each year. The Bedford Agassiz won first prize [entry cards marked first prize are attached to the minutes book] in the May exhibit several times, the only exceptions being once when first prize was carried off by young collectors at The Botanical Garden and two years when we were unable to send exhibits. We won first prize at the June exhibition each time we were able to compete; one year took second prize for collection of native ferns, first prize going to Siebrecht & Co. . . . Two years children helped collect [wildflowers] and a number of them went to the Botanical Garden and helped to arrange the exhibits. The exhibits won prizes as much by the care with which they were arranged as by the number and variety of specimens shown."

July 14, 1909. "... It was decided to make a collection of the local flora of Bedford. The old collection begun in 1888 and '89 was examined and found to be in good condition. Miss Bates' fern collection was found to be in excellent condition. ..."

"Through the interest of Dr. N. L. Britton, The New York Botanical Garden undertook to furnish the necessary outfit of mounting and drying papers for the collections in consideration of receiving duplicate specimens of any rare or interesting varieties for their local Flora. . . ."

1910 . . . Miss Luquer kindly consented to allow the Society to give an exhibition of her pictures of wildflowers in the Court House. . . . Mrs. Britton gave a talk on the wildflowers. The Court House was full, both children and townspeople being present. . . ."

"Large additions to the collections were made during the year."

1911. "In June, Miss Luquer gave for the Society and for the school children a talk by Nina J. Marshall on flowers and insects illustrated by large models. It was greatly enjoyed. The New York Botanical Garden gave further donation of mounting paper."

1912. "In the early spring of this year a meeting of the Society was held at the Women's Cosmopolitan Club in New York to consider a plan . . . for using the Old Stone School House for a museum of local historical and local natural history collections. The idea met with general approval." (The plan was referred to the School Commissioner and Trustee of the School District and met with their approval).

"On July 6, Mrs. James S. Day and Mrs. Lathrop Colgate went to Mrs. O'Brien's residence and formally took possession of the School House for the purpose mentioned above. . . .

"The sum of $500 was given as an endowment fund in memory of Mrs. Lea Luquer, the founder of the Bedford Agassiz Association."

June 23, 1916. "... Miss Marble and Miss Luquer, a committee to plan for the correct and legal method of handing over the lease of the Museum and its funds to the Bedford Historical Society. . . ."

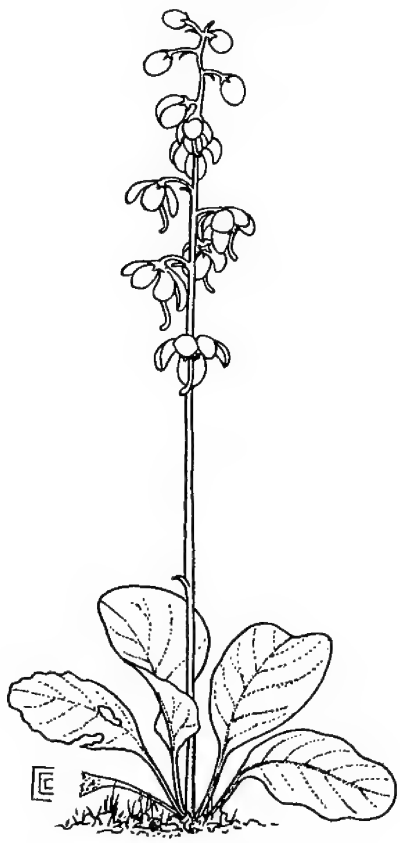
December 1, 1916. "... Miss Marble and Miss Luquer reported having consulted Mr. Spafford concerning the transfer of lease of Museum Building and funds to the Bedford Historical Society. Mr. Spafford informed them that the transfer could readily be arranged. . . . It was resolved, on motion of Miss Luquer, seconded by Miss Colgate, that the Agassiz Society should transfer the lease of the Museum Building and the two memorial funds, each of $500 given by Miss Luquer and Mrs. Maddock, on the proviso that the income of the memorial funds be used for the support and upkeep of the Museum. . . ."

From a letter dated March 1, 1917, from Thatcher T. P. Luquer, President of the Bedford Historical Society, to Mrs. Emily H. Spafford, Secretary of the Bedford Agassiz Society: "At a meeting of the Directors of the Bedford Historical Society, the offer of the Bedford Agassiz Society . . . was formally accepted with thanks, with appreciation of the spirit in which the transfer is made, and in accordance with the conditions mentioned."

HOUSEWIFE'S GARDEN (from page 177)

ish white flowers are too small to be considered photogenic, unless the picture can be magnified several times. When a television studio in Chicago phoned to ask where they could find a dozen or more coriander plants in bloom in June, I was struck with the way in which herbs have come to the fore. One of the large meat-packing concerns wished to show the herb, with which its product is flavored, in a television commercial.

Pyrola elliptica.



I had a dozen plants of coriander in flower but did not invite the television cameraman, who would "go anywhere in the country to film them," to come here. They were growing in a scattered group where the seeds had fallen. No amount of trick photography would make the very slight, two-foot tall plants resemble a field row planted for harvesting. Then, too, I could imagine the repugnance with which someone not enthusiastic about herbs would encounter this herb. The scent of squashed bugs which is released upon disturbing the foliage of coriander is not to most people's liking. So marked is the odor that the ancient Greeks named the herb 'koris" meaning bug, and Gerard, the English herbalist, said in 1597, "it is a very stinking herbe."

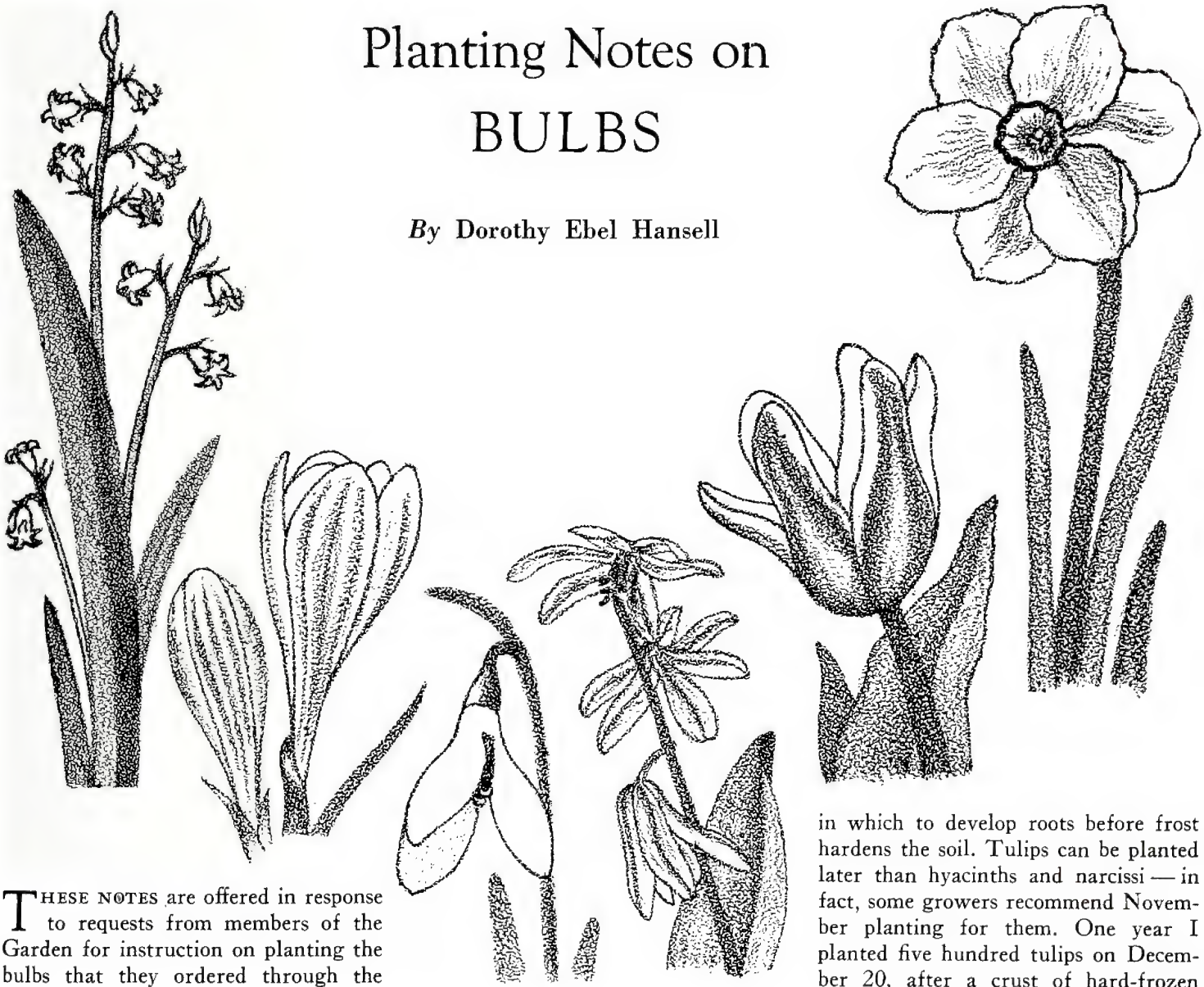
Each year thousands of pounds of coriander seed and oil are imported into this country for the drug and food trades. The green herb is grown in quantity in India, China, South America, and Central America for flavoring soup and for use in salad. In Spanish it is called "cilantro," and it is so labelled in Mexican markets. Coriander is rich in vitamin C, and the dried fruits yield important amino acids. It is a hardy annual herb, matures in sixty to ninety days, and can be grown in all parts of this country, yet few gardeners recognize it in seed or in leaf.

The lower leaves of coriander resemble those of anise, being rounded with toothed edges. The upper leaves are linear, becoming more and more inconspicuous as the delicate flowers give way to seeds which seem top-heavy on the slender stems. The seeds, properly known as fruits, are almost perfect spheres, an eighth of an inch in diameter. When dried they split apart into halves which enclose a single kernel or seed in each. In India where coriander is a large crop, the seeds are rubbed by hand to distribute the hemispheres when planting. In my garden some of the fruits are scattered over the place where the ripe plants have been pulled, and next year's crop is

(Continued on page 190)

Planting Notes on BULBS

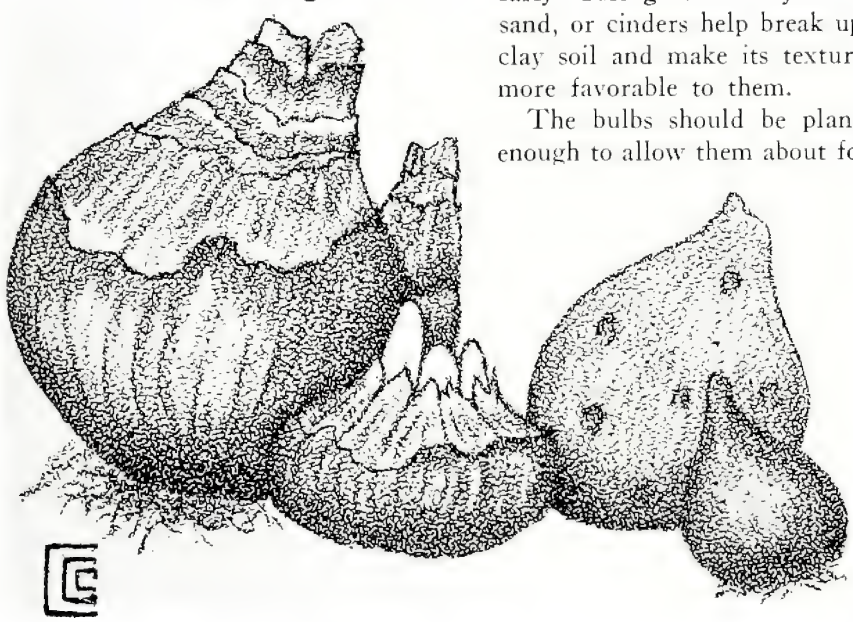
By **Dorothy Ebel Hansell**



THESE NOTES are offered in response to requests from members of the Garden for instruction on planting the bulbs that they ordered through the Garden.

Tulips, narcissi, hyacinths, crocus, and the "minor" bulbs are planted in the fall in well-drained garden soil—a fertile loam. Drainage is important. These bulbs dislike a wet soil, particularly during dormancy. Peat moss, sand, or cinders help break up a heavy clay soil and make its texture lighter, more favorable to them.

The bulbs should be planted early enough to allow them about four weeks in which to develop roots before frost hardens the soil. Tulips can be planted later than hyacinths and narcissi — in fact, some growers recommend November planting for them. One year I planted five hundred tulips on December 20, after a crust of hard-frozen soil, three inches deep, had been lifted. The display of superb blooms on stalwart stems the following May was magnificent. I am not suggesting that this very late planting be practiced — it was a cold and uncomfortable task,



though most rewarding—but cite the incident to indicate that late planting can be done if circumstances demand.

After the soil has frozen to a depth of two or three inches, a winter covering of evergreen branches, salt hay, or leaves other than maple may be provided to prevent the damage or loss that sometimes occurs from alternate freezing and thawing.

In preparing the soil for planting bulbs it should be dug to a depth of ten to twelve inches, and leafmold, peat moss, or humus should be thoroughly incorporated. In the upper six or eight inches in which the bulbs are to be planted, bonemeal or a complete fertilizer (5-10-5 analysis) should be added. The soil is leveled at the planting depth recommended for the particular kind of bulb. The bulbs are planted, pointed end up, at the proper distance apart and then covered with good topsoil. Another way is to prepare, to the proper planting depth, an individual hole for each bulb. This is an easier method for planting a few bulbs in front of shrubs or in a mixed border, but the former method gives a more uniform appearance when one is planting beds of bulbs in larger quantities.

Tulips are planted five to six inches apart and five to eight inches deep. The deeper planting is necessary if the bulbs are to be left in the ground and not lifted, sorted, and stored during the summer for fall replanting. Tulips prefer a sunny location, though they will tolerate very light shade.

Narcissi are planted six to eight inches apart and five to six inches deep, except the species and some varieties. These are planted three inches deep and three to four inches apart. Narcissi are left undisturbed in the ground until they produce poorer and fewer blooms. Then, after the foliage has died, they should be lifted, separated, and replanted.

Hyacinths are planted six to eight inches deep and the same distance apart. They require sun and give a more satisfactory performance if lifted and stored during the summer for fall replanting, though some gardeners do leave them in the ground for several years with good results.

Crocus are planted three inches deep and three to four inches apart in sun or in light shade. It is essential that their foliage be allowed to die down completely — it must not be cut off before it is fully ripened. This creates a problem if crocus are planted in a lawn; it is advisable to reorder and replant crocus bulbs every fall.

Chionodoxas, eranthis, galanthus, muscari, and scillas are generally referred to as the "minor" bulbs. The planting depth, from the top of the bulb to the surface of the soil, for chionodoxas and galanthus is three inches; for eranthis, muscari, and *Scilla sibirica,* two inches; for *Scilla campanulata,* four inches. *S. campanulata* is taller and more robust-looking than *S. sibirica.* The latter is pretty among rocks, in clumps in front of shrubs, or in the foreground of a mixed border. The former is useful for naturalizing in open woods.

On the whole, the minor bulbs are most happily planted in and around rock crevices, on sloping ground, or in a slightly raised bed, so that they get the drainage they need and so that their flowers, borne on comparatively short stems, are not so likely to become mud-spattered during heavy spring rains.

These minor bulbs are not lifted and stored, but are allowed to remain and multiply where planted. If they should become overcrowded and their blooms lessen, then it would be time to lift, sort, and replant immediately, or to store them for fall planting.

Mice, squirrels, and chipmunks find crocus especially tasty, and rabbits relish the tender young foliage. They do not appear to bother the minor bulbs.

HOUSEWIFE'S GARDEN (from page 188)

assured. Coriander will reward you with pretty little blossoms and pleasantly spicy fruits year after year though you, with Gerard, may say "I never sowed the same but once."

Few people are indifferent to this herb. Twenty years ago when it was never mentioned outside of the spice trade or books about herbs, Rosetta Clarkson praised the seeds as wonders of nature's design. She grew a good deal of coriander and incorporated the dried fruits in her famous pot-pourri mixtures. Helen Fox, author of *The Years in My Herb Garden* and two other books on herbs which helped to bring the little-known aromatics to the popularity they enjoy today, warned herb gardeners not to mistake the leaves of coriander for those of anise, since the former taste so unpleasant.

Dioscorides, Greek herbalist of the first century, praised it and at the same time cautioned his readers against coriander. The seeds, on being "drank," expelled worms, and "it is engendering of seed. But being taken too much it disturbs ye understanding dangerously, whence men ought to avoid the overmuch, & too much use of it." No wonder coriander appears as an aphrodisiac in a *Thousand and One Nights.* Gerard and other English herbalists felt that the seeds could be dangerous—today we know that an excess can produce narcotic effects. Still they advised coriander for promoting digestion and for preserving meats. In the former use they were often sugar-coated to form round balls, sometimes colored pink, called "comfits." Such pellets can be still bought on paper tapes, but unfortunately the spicy seeds of anise, coriander, or caraway, which might have given the candy some character or value, are missing in the centers.

Culpeper who loved to wade into any controversy seems to have ignored coriander in his herbal. At least I could find no mention of it in several reprint editions of the *English Physician,* known as *Culpeper's Complete Herbal* in modern times. Gerard declared the green herb "unwholesome and hurtfull to the bodie." He even mistrusted the ripe seeds unless they were dried, soaked in wine or vinegar, and dried again before they were used. He suggested that:

"No Apothecarie ought to sell the seeds of Coriander to any person, except it be first prepared in manner above said, neither ought they to put the same in medicine: for although the seed well dried be of good taste, yet it is not altogether voide of some of that filthie and venemous quality which remaineth in the greene herbe . . ."

Coriander has belonged to many civilizations. Seeds were found in the Egyptian tombs. The Israelites described manna as being like coriander. Meat was preserved with the seed of coriander and sprinklings of vinegar in ancient Rome. Chinese emperors sent out parties to collect plants and considered *Coriandrum* a prize find. Coffee served with kernels of coriander fruits crushed in the bottom of the cup is a treat for visitors in India even today.

From the Indian Embassy I learned that this important ingredient of curry powder is grown in all states of that country as well as in Asia Minor, Russia, central Europe, and Morocco. The entire plant, when young, is used in India in preparing chutneys and sauces, curries and soups. The ripe fruits are extensively employed as condiment in making curry powder, pickling spices, sausages, and mixed seasonings. They are used for flavoring pastry, cookies, buns, and cakes, and tobacco products. In the United States and in Europe the oil is added to gin and other liquors. This is another contradiction, for the herbalists reported that coriander reduced the intoxicating effect of spirituous liquors. The fruits are considered soothing, antibilious, cooling, and aphrodisiac. They are used to correct the griping qualities of rhubarb and senna. The seeds will remove unpleasant breath when chewed. Quite a useful herb even if it never appeared on television.

REFORESTING (from page 185)

make them available to farmers. Through 4-H Clubs and other farm youth groups, they have helped train a new generation of tree planters. State agricultural experiment stations have had a hand in testing improved varieties of nut trees and pines from a wide range of seed sources.

Two other Federal-aid programs have also influenced tree planting in the Tennessee Valley: the Agricultural Stabilization and Conservation program and the Soil Bank program, both administered by the United States Department of Agriculture. The former, an extension of the Agricultural Adjustment Administration Act of 1933, provides payments to farmers to help defray tree-planting costs; the latter offers financial assistance in the conversion of crop land to long-term conservation use, plus annual rental payments on such lands. Through 1958, landowners in the one hundred and twenty-five Tennessee Valley counties had received ASC payments exceeding $511,000 for reforesting over 63,500 acres. By the same date, close to one hundred thousand acres had been put in the Conservation Reserve of the Soil Bank under contracts that will net landowners over two and a half millions. However, less than ten per cent of this Conservation Reserve was planted to trees.

TVA has invested over eight hundred million dollars in dams, locks, and hydroelectric facilities. Our primary tree-planting objective is to protect this investment against the damaging effects of erosion and silting. However, as we reach this objective through reforestation and better forest protection, management, and utilization, we also improve the economic value of the resource. Industrial forest-product values, now estimated at four hundred and fifty million dollars a year, can be increased to eleven hundred millions. Jobs in forest products industries can be increased from the present fifty thousand to two hundred thousand.

If the planting rate can be maintained at eight million seedlings a year, the reforestation job in the Tennessee Valley can be completed in the next fifteen years. The cost is estimated at thirty million dollars — two million a year — shared about equally by cooperating public agencies and the landowners who do the planting.

Over a half-century or less we can expect to harvest from these hand-planted forests seven hundred and fifty million fence posts, twelve million cords of pulpwood, and twenty-seven billion board feet of poles and logs. At present prices these primary products would be worth more than two billion and two hundred million dollars. In terms of pulp and paper, treated poles and piling, finished lumber and other millwork, values would be well in excess of five billion dollars.

Wood requirements in this country are expected to increase at least fifty per cent by the end of the century. We cannot wait till then to provide these needs; we have to start now. Richard E. McArdle, Chief of the United States Forest Service, said recently that the sixties will be the "decade of decision" for the American timber industry. He predicts that old-growth timber, which now supplies about one-third of the national needs, will be practically gone by the year 2000. Our inheritance will have been used up. Here in the Tennessee Valley, where old-growth timber ran out years ago, we are well on the way toward ensuring a continuous supply of timber for industry and a protective cover for the watershed of America's fourth largest river.

THE BED O'PATTIKEWS

From *Moby Lane* by A. Neil Lyons, published in London, 1916, by The Bodley Head Ltd. (founded in 1892 by John Lane).

Dr. H. W. Rickett, Bibliographer and Acting Assistant Director (Botany) of The New York Botanical Garden, has a copy of *Moby Lane* in his library. He suggested to the Editor that readers of *The Garden Journal* might enjoy the chapter on "The Bed O'Pattikews."

GIDEON HEMUS used to live in Sloe Cottage, which stands at Sly Corner, near the crossroads, behind the blacksmith's, not far from Blowfield, in Sussex.

I first became intimate with Mr. Hemus in connection with certain mercenary transactions. I had been conducting barter with Ellen Mary Hemus, Gideon's wife, in the matter of Campine cockerels. When Mrs. Hemus came out with the change to their cottage gate, she uttered the following strange speech:

"Hemus send his respects, sir, and will you please to walk inside. If it isn't taking a liberty, he would like you to look at his pattikews."

"But I am not a doctor," objected your servant.

Mrs. Hemus regarded me with an expression of surprise.

"Cert'nly not, sir," she answered. "You be a gentleman. We know that."

"Isn't it a disease, then?"

"Sir?" queried Mrs. Hemus.

"This—ah—patticuse. It has a pathological sound."

"Cert'nly *not,* sir," replied Mrs. Hemus, with spirit. "I woon't *hear* of such a thing, that I woon't. Anybody's welcome to come into my house, that they be, and look for theirself."

I made apologetic noises. Mrs. Hemus reciprocated. She opened the gate, and I followed her into their little front garden. Mr. Hemus, extruding his head from an attic window, proclaimed that he was mending his trousers, but that in half a minute he would have completed that act of decency and could then join me. He requested me to be so good as to wait. I accordingly waited: and Boreas did blow.

When Mr. Hemus eventually descended—the process of rehabilitation had occupied much more than half a minute—a suspicion which had been gradually forming in my mind was confirmed. The pattacuse—or pattikews,

as I soon learned, under Mr. Hemus's direction, to call them—belonged to the race of vegetables. A horticultural work of reference, which I have since consulted, insists upon calling them hepatica. It says that this is a well-known name applied to a section of the anemone family, Order *Ranunculaceae*.

The pattikews, when I first beheld them, were clothed in their mid-winter *deshabille*. Mr. Hemus pointed to a vast bed of low-growing foliage, which occupied the best part of his front garden. A novice, such as I was, might have mistaken the plants for ground ivy, as I did—ground ivy which had succumbed to an attack of jaundice. Mr. Hemus stroking the leaves with his gritty blue fingers, invited me to do homage to them. I wondered (having at that moment no opportunity of consulting a horticultural work of reference) whether they constituted a salad.

"Did ever you see such pattikews as they be?" demanded Mr. Hemus.

I admitted that I never did.

"He have grown them," said the voice of Mrs. Hemus, in tones of soft affection, "according to a patent of his own. They areun't been allowed to flower this three yeer past, that they areun't. Oold Amos Pranklyn, the hedger—him over at Franklands—*he* rackon to grow pattikew. But . . ."

Mrs. Hemus finished her sentence with a derisive laugh.

"Amos," stated Gideon, "will find out what a pattikew really look like, come Easter. 'Tis no manner o' use to leave 'em bloom, not until the roots be got a-holt. So I are tal oold Amos; but th' oold beggar, he be that stubborn, he don't never listen to what anybody tal him. A pattikew that want two year, it do, to get a proper holt with its root. And even then, if a person rackon for to grow blooms as *he* blooms, he got to nip off the buds in the third year. Well, we'll see about it at Easter time. Oold Amos'll find out what a pattikew really look like, come Easter, shouldn't wonder."

"You see, sir," explained Mrs. Hemus, "he have growed them according to a patent of his own."

II

When I next heard of the pattikews, I heard a tragic thing. They had been trodden on. The treading was performed by a stag, three boys, a dozen men,

A nosegay of hepaticas.

half a dozen horses, and eight couple of hounds.

It seems that the staghounds had been invited by Squire Kosky to breakfast and other hospitalities, including the right of entry to Mr. Hemus's garden. Squire Kosky himself does not hunt stags, that pursuit being an active, very noisy and slightly dangerous one. But he does eat breakfast, and well he can afford to do so, being the Head and Brain of Kosky and Leverson, the Imperial mathematicians.

They brought the stag in a sort of windowless hearse, and, after they had breakfasted with Kosky, they opened the hearse and the stag jumped out and ran away.

After the stag (which, by the way, was a hind) had been allowed to run for a certain number of minutes, as recorded by the watch of a stout gentleman on a stout horse, who, at stated intervals, uttered the words: "Hounds, ladies and gentlemen, please!" they all ran after it and found it, after a brief search, in Gideon Hemus's garden, where it and the hounds and the horsemen and a detachment of peasantry and several highly illuminated servants with whips did not do much good to the bed of pattikews.

I found, on offering my condolences to Gideon, that the husbandman treated the matter with admirable philosophy.

"'Tis a pity in one way," he confessed, "for they was fit to bloom, come another fortnight. But 'tis of no consequence in the main; for I can easy nip their buds off, to set them back again, and mulch 'em. The blooms'll be something to look at *next* year. You can't keep a pattikew back too long. The secret of growin' pattikew, that be to let their roots get a firm holt of the soil. I shouldn't wonder but what oold Amos Pranklyn find out what a pattikew look like, come the Easter arter next."

[However, the pattikews were not to bloom the "Easter arter next." Gideon was forced, by unfeeling powers, to move to another cottage, situated in an old excavation known as "The Hole."]

V

I then asked him who had been barking the fruit trees at Sloe Cottage. He re-opened his clasp-knife and jabbed again at the stile.

"Have they been spoilin' they fruit trees, then?" he asked, with averted eyes. "They fruit trees was planted be moi oold father. 'Tis a pity if anybody are damaged them. The boys and young lads, they be ser saucy and mischievous nowadays. Moi father, *he* planted they trees—all exceptin' the quince tree, and that weer put in be moi gran'father. 'Tis a pity if anybody are damaged them. Hey? Well, I'll be gettin' on." He lifted the basket of clay and leaves to his shoulder.

"These," he said, with a sideways jerk of his head, "'ull 'ave to put up with it, same as me, I spoose. Their roots'll have time to get a hold before the spring come, I shouldn't wonder. They'll 'ave to go through with it now, whather or no. Oold Amos 'e'll git the laugh of me, if I don't show a bloom *next* spring."

But there was a further delay in the production of those remarkable flowers. On a night in January, there came one to my cottage who asked for a ladder. He said that the house in "The Hole" was burning, and that Gideon wanted to rescue his potatoes from the loft.

I returned with this man to the house in "The Hole," which, I found, was burning well and brightly. Squire Kosky, with whom were the Misses Kosky, wearing theatre wraps, was present, and directed the salvage operations with much spirit and gesticulation. No fire engine had arrived, because the fire engine has yet to be invented which Gideon can carry on his shoulders.

(Continued on page 195)

THE GARDEN TAKES A FRESH LOOK AT MEMBERSHIP

WHY DOES The New York Botanical Garden have several classes of membership? What are the distinctions between them, and what are the reasons for moving upward from one class to another?

Such inquiries are made with sufficient frequency to warrant a fresh look at the meaning of membership, particularly in view of some changes made by the Garden's Board of Managers on September 1, 1960.

A good starting place is the constitution of the Garden, drafted sixty-nine years ago and still the keystone of the Garden's corporate structure. According to this document, the corporation was created "for the purpose of establishing and maintaining a botanical garden and museum and arboretum . . . for the collection and culture of plants . . . for the advancement of botanical science and knowledge, and the prosecution of original researches therein . . . for affording instruction in the same . . . and for the entertainment, recreation, and instruction of the people."

These purposes are reflected in today's membership classifications, even though at first glance there are no apparent distinctions. The annual member who pays dues of $10 has the same privileges as the life member who has contributed $1,000 or more. But there *are* distinctions, intangible perhaps, but real in the special and lasting satisfactions they bring to the individual.

Here's how we think of the various categories today.

ANNUAL MEMBERSHIP

Annual members paying dues of $10 a year constitute the largest part of Garden membership, and individuals in this group receive *The Garden Journal,* are entitled to discounts on fees for instructional courses, are permitted to park their cars and to ride on the "Floral Flyer" without charge, are offered plants from time to time free or at a special price, and generally enjoy a sense of being in a company of people whose interests in gardening and botany parallel their own.

When the cost to the Garden of providing these privileges has been subtracted from the dues, the balance might well be considered as being used in helping to maintain the Garden physically — in short, in pursuit of the stated purpose of providing *"recreation* of the people."

CONTRIBUTING MEMBERSHIP

Members in this category pay $25 a year and enjoy the same privileges as annual members. But here the difference in cost between the provision of membership privileges and the dues might be thought of as contributing toward the Garden's educational program.

Fees from students in the Garden's classes and from lectures delivered by staff members are hardly sufficient to maintain the educational function of the Garden. Almost everything in the Garden — from the labels on plants and trees through the Garden's publications, the replies by staff members to questions from members and visitors, and the displays in the museum — help the Garden fulfill its educational role.

Therefore, we think of members in this category as special *contributors* toward botanical and horticultural *education.*

SUPPORTING MEMBERSHIP

Members in this group, who pay dues of $100 a year, enjoy the same privileges as annual members but can in addition think of themselves as helping to support the Garden's third purpose: "the prosecution of original researches" in the botanical field.

Industrial companies and such institutions as the National Science Foundation frequently make grants in aid of specific research projects and expeditions under the Garden's auspices. But the day-in, day-out experimentation and research that go on in the herbarium, in the field of plant classification (taxomony), in the propagating houses, in the laboratories, the conservatory, and the gardens themselves, require special support, and sometimes the rate of progress in a significant investigation is governed by the funds that are available.

The supporting member is a pillar of strength in the Garden's recreational and educational activities, to be sure, but mostly his *support* is felt in the realm of *research.*

HUSBAND AND WIFE MEMBERSHIP

The newest category — husband and wife membership at $15 a year — is a variant on annual membership and was introduced on September 1, 1960 in response to a number of requests. Only one copy of *The Garden Journal* is delivered to the joint membership, and when a plant distribution offer is made, the terms are those that apply to a single annual membership. On the other hand, both husband and wife are eligible for the discount on tuition fees for Garden classes, and membership cards are delivered to both.

GARDEN CLUBS

Garden Club membership at $50 a year has mutual benefits. The garden clubs receive the Garden's publications, have access to staff members for advice and suggestions, are encouraged to come to the Garden for club tours and luncheons, and for a nominal fee of $25 can enrich their programs with an illustrated lecture by a staff professional. The Garden, on the other hand, benefits from their interest, their comments and suggestions, and their loyal support.

LIFE MEMBERS

Life members are those benefactors who pay dues of $1,000 or more in one single payment to the Garden. Many of the Garden's most attractive features are attributable to this kind of generosity. The payments are applicable to the Garden's normal operations.

ORGANIZATIONAL MEMBERSHIP

Finally, several industrial companies make flat annual payments — usually in multiples of $500 — to the Garden. They are called organizational members and might be grouped with the supporting members in the sense that they, too, have a continuing interest in the furtherance of plant research. Frequently throughout the year technicians representing these companies are in consultation with the Garden's experts.

As the Garden's researches expand, more and more manufacturers and distributors of medicines, foods, cosmetics, and many other familiar products are becoming organizational members.

THE PRESENT STATUS

Total membership in the Garden today is about 2,800. In view of the

Garden's international stature and its wealth of attractions, this seems like a modest total. On the other hand, membership has been increasing for the past two years at a rate which justifies the expectation of twice as many members in 1965 as the Garden had in 1955.

The Prospect for the Future

Obviously with a membership of this size, with dues scaled as they are, and with costs of maintenance continuing to rise, the Garden could not exist on dues and contributions alone. Fortunately, through its Department of Parks, the City of New York pays about half the cost of maintaining this 238-acre operation.

But the prospect of growth, of enrichment of the membership privileges, of better facilities, of the introduction of more rare and exotic plants, lies in the membership area.

Talk with almost any staff member and you are likely to be deluged with ideas as to what could be done in this beautiful setting. What *will* be done depends largely on a sustained growth in membership.

Henceforth *The Garden Journal* plans to publish quarterly lists of new members, and probably even a full membership roster. YOU can help importantly by inviting your friends to join.

H.W.L.

In this issue we publish:

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Mrs. Beaumont Allen
Douglas H. Allen
Arthur M. Anderson
Mrs. Arthur M. Anderson
Mrs. Ernest Angell
Mrs. Elliott Averett
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New York Unit of the Herb Society of America
North Country Garden Club
North Suffolk Garden Club
Garden Club of Orange and Dutchess Counties
Pawling Garden Club

(Continued on page 204)

PATTIKEWS (from page 192)

It was a notable conflagration. Much of Gideon's furniture was destroyed by it, including the Bible-box; but they saved his potatoes, and Mrs. Gideon's mangle and her stuffed owl. My memory of the scene, as a whole, is confused, but I remember that Mrs. Gideon was the object of devoted attentions from a group of feminine convives, who offered her vinegar and ale. And I remember that Mrs. Gideon wept continuously. I remember also that the youthful population of the parish was very numerously represented and that its proceedings were the object of constabulary attention. I likewise remember that hoarse-voiced men kept telling other hoarse-voiced men to "look out," because the roof was certain to fall in, which it ultimately did, among a cascade of sparks, but with a singular avoidance of noise or fuss.

That which I chiefly remember, however, is the peculiar conduct of Gideon Hemus.

When I first arrived at the scene of this illumination, Gideon was not visible. Other members of the audience told me that he had retired to a distant knoll, with a basket containing dirt and roots. I looked for this knoll and found it, just as the roof fell in.

Gideon sat among his baskets, nursing a spade. He had lighted a pipe and was smoking it, thoughtfully, as he gazed at the spluttering ruins of the house in "The Hole."

During the whole period of his vigil, he only uttered one speech:

"That's well alight," he said. "Burning strong. Hey?"

Mr. Kosky objected to this behaviour. He said, and caused it to be known that he had said, that it was extraordinarily suspicious behaviour. He said, and caused it to be known that he had said, that Gideon's conduct might have to form the subject of inquiry. In the meantime, he commanded the Hemuses to inhabit a newly-erected cottage on the top of Abbot's Hill.

Here the wind is an important horticultural factor, and here the pattikews throve amazingly.

VI

They were planted by Gideon in straight, bleak rows. The garden which they adorned was itself a singularly bleak and expressionless garden. It consisted of pure sub-soil, enjoying what is called an open situation. But the pattikews like it.

Gideon planted them in January. By the middle of March, they were in bloom. Not having ever seen a pattikew, and being curious to inspect the favourite flower of Mr. Hemus, I ascended that breezy height and looked at them.

I thought that they were interesting flowers; but a friend who was with me, and who is a Poet, used stronger language. "That isn't flowers," he said, "It's a piece of the sky which has fallen down."

He began to talk deliriously. Without pretending to countenance his unmanly emotion, I admitted that the flowers were nice. I even admitted that Gideon was perhaps right: that all this goodness was worth the trouble which he had been at to get it. I then opened the little gate which led to the garden.

"What are you doing?" demanded my friend.

"I am offering thanks," I replied, "to the man who grew these flowers." With that, I snatched a nosegay from the bed of pattikews.

We then walked to a house five miles away, at Cuckfield. In this house we found Gideon, who stated that he had left the house on Abbott's Hill, and was going to remain for the rest of his life at Cuckfield. His new and final habitation was called "The Cuckfield Workhouse."

I gave him the nosegay of pattikews, which he was very glad to receive. He said:

"Be they *moi* pattikews? They ha' took a-holt, then, arter all."

BOOK REVIEWS

HOW TO MAKE MONEY FROM YOUR HOME GREENHOUSE. Peggie Schulz. 324 pages, illustrated, indexed. D. Van Nostrand Company, Inc., New Jersey. 1959. $5.95.

This book is a well-written account of the many ways in which a small greenhouse may be operated to produce a financial return. This return may be a profit after an exact accounting of all costs. Or the owner may not keep books on his capital investment and the hours of personal labor required, and regard this return as an offset on the costs of maintenance. In any event, a cash return from the average small greenhouse is something most owners will welcome, and it is helpful to learn how such a result may be achieved.

This reviewer can find little to criticize, item by item, in this optimistic presentation. He knows, through a fairly extensive personal experience with small greenhouses and growing conditions ranging from dry cacti to lush growers in high humidity, that there is a factor for success in each of these recommendations. But this factor will often be greatly influenced by the competence of the individual, the geographical area involved, the character of the immediate neighborhood (residential, commercial, or rural), the actual existence of a paying market, the ability to supply and deliver on a promised schedule, and finally the tax status which may figure at the federal, the state, and the municipal level.

It is obvious from the text that the author has been most fortunate with respect to the influences just enumerated. In some of the larger cities the commercial outlets for plant material are so rigidly channeled that the small amateur stands no chance of establishing a market upon which he can count. In tax-hungry municipalities, commercial traffic in plants is certain to be assessed.

In conclusion, it may be said that anyone who would like to speculate in this intriguing pastime of making a small greenhouse pay will find this volume of great interest. He will be well advised to proceed cautiously, and test out, step by step, each idea that commits him to much expense or responsibility. In brief, do not spend the money your greenhouse brings in until you get it!

HAROLD E. ANTHONY
Englewood, New Jersey

HOW YOU CAN GROW BEAUTIFUL ROSES. John R. Whiting (ed. by). 143 pages, illustrated. Arco Publishing Co., Inc., New York. 1959. $2.50.

This book, a readable guide to rose growing for the amateur as well as expert rose fancier, contains many excellent, self-explanatory photographs. These are fairly complete and in one section offer many ideas for floral arrangements. There are, however, no illustrations or information on preparing roses for exhibition.

The editor, John R. Whiting, covers the main classifications of roses and discusses the individual aspects of each variety. There is a very good chapter on miniature roses which gives useful information about these tiny, perfectly formed, fully fragrant flowers. He also presents a good list of fragrant roses.

In a discussion of the hybrid teas, it is suggested that these plants be spaced two feet apart. This would not allow for full growth; spacing two and a half to three feet would reap better results.

Mr. Whiting mentions that it is inadvisable to over-prune the first year, and stresses the point that roses will grow in a variety of soils as long as there is humus. He notes that in different areas of the country, roses must be cared for differently. It is stated, too, that beautiful roses may be grown without the use of expensive special rose foods or fertilizer; instead one can favorably use compost and ordinary garden fertilizer plus trace elements.

Finally, the book advises against cutting, as the vigor of the bush is reduced if foliage is cut away.

This is an informative as well as an attractive addition to the home library.

A. D. MOLLIN
Great Neck, Long Island

A FIELD GUIDE TO TREES AND SHRUBS. George A. Petrides. 431 pages, illustrated, indexed. Houghton Mifflin Company, Boston, Mass. 1958. $3.95.

This addition to the Peterson Field Guide Series is outstanding for the amount of material it contains, and it offers much assistance to amateurs searching for the identities and salient characteristics of woody plants found growing wild in the general "Gray's Manual area." Approximately six hundred and fifty kinds of trees, shrubs, and woody vines are treated, including most of the ones naturalized from other parts of the world.

The author has worked diligently in simplifying descriptive terms. Pinnately and palmately compound leaves become "feather-compound" and "fan-compound" (sic), and one can only hope that students with any ideas about fans sometimes being made from and with feathers are sufficiently strong-minded to put these notions out of their heads. Attempting to set things straight by looking in the generally good short glossary, one finds no definition but a detour after *palmate,* to "See various *fan* prefixes." Similarly, under *pinnate,* one is passed on to the feather department.

Such a concise workaday term as *ovate* is all but outlawed from these pages—having been found just once, and not admitted to the glossary. It is replaced by *egg-shaped,* which applies equally to the leaves of silky dogwood and to the habit of sugar maple, and any tidy distinction between essentially plane and solid structures is not encouraged. Characterizing sugar maple as having a "Short stem; full egg-shaped head" (page 5) seems devastating.

Tree silhouettes are an attractive feature of the book, and they are convincingly done. Some descriptions of these drawings cause queries. White spruce, Norway spruce, and American larch are described as "pyramidal," while balsam-fir, red-cedar, and others are "conical." Pyramidal plant outlines result only from shearing and clipping to produce flat-sided specimens, and nature has other objectives in mind.

The book is attractively and durably made, and a valuable addition to popular guides to the world of trees and shrubs.

BENJAMIN BLACKBURN
Drew University
Madison, New Jersey

ILLUSTRATED GENERA OF RUST FUNGI. George B. Cummins. 131 pages, illustrated, indexed. Burgess Publishing Co., Minneapolis, Minnesota. 1959. $4.50.

The rust fungi, obligate parasites on ferns, conifers, and flowering plants, have received considerable study by mycologists, botanists, and plant pathologists. To the gardener they are known as the casual agents of serious diseases of many cultivated plants. From a taxonomic viewpoint the rust fungi are perhaps better known than any other major group of fungi. A vast amount of literature has accumulated, devoted to descriptions and classification of species of rust fungi. Since the literature is scattered in many journals and published in many languages throughout the world, it has been difficult to gain a clear picture of the kinds of rust fungi living in the world today.

Dr. Cummins of Purdue University, who is the leading taxonomic authority on rust fungi, has alleviated this problem by presenting, in this manual, keys, descriptions, and illustrations of the genera of the rust fungi (Uredinales) of the world. An introductory chapter reviews the morphology and terminology of the major structures of rust fungi and includes illustrations which clearly point out the distinguishing characteristics of each. A section on life cycles is included. The bulk of the manual consists of descriptions and illustrations for each of the ninety-five genera of rust fungi at present known in the world. The illustrations are the outstanding feature of the work and consist of photographs, schematic sketches, and drawings made from specimens with the aid of a camera lucida. For each genus, references to monographic and regional treatments are given.

The manual is a splendid contribution in the field of mycology and of plant pathology. It is another of the excellent spiral-bound manuals in botany published by Burgess Publishing Co.

CLARK T. ROGERSON

THE RELATION OF FUNGI TO HUMAN AFFAIRS. William D. Gray. 510 pages, illustrated, indexed. Henry Holt and Co., Inc., New York. 1959. $8.50.

At last a textbook has appeared which presents the potential and actual role of fungi in human affairs. Dr. Gray has written an excellent treatise and up-to-date summary of practical mycology, stressing the often unrecognized beneficial features of fungi to mankind. He clearly shows by the accumulated evidence that fungi are predominantly beneficial in man's welfare; at the same time recognition is given to the harmful role of fungi.

Following a brief but adequate introduction covering the morphology, classification, identification, number, isolation, and laboratory cultivation of the fungi, the book is divided into two parts. Part I dealing with the beneficial activities of fungi consists of eighteen chapters. The first of these presents a splendid portrayal of the vital role that fungi plays in the destruction of organic waste. Well-organized and clearly presented summaries of our knowledge on mycorrhizae, industrial mycology, direct utilization of fungi as food, fungi and food processing, production of livestock feed, fungi in medicine, alcoholic fermentation, synthesis of gallic, citric, gluconic, itaconic and kojic acids, fungus enzymes, glycerol and fat production, miscellaneous fungus activities, and use of fungi in biological assays form the larger portion of the text. Part II discusses the harmful activities of fungi and consists of six chapters dealing with plant disease, destruction of timber products, tropical deterioration, fungi in the paper industry, food spoilage, fungi as allergens, pois-

onous fungi and finally medical mycology.

Good illustrations complement the book throughout. A well-selected list of references is found at the end of each chapter.

Without question this book is the best available summary of our knowledge of practical mycology. It should be useful as a textbook as well as a reference book on the subject.

CLARK T. ROGERSON

A GUIDE TO THE HISTORY OF BACTERIOLOGY. Thomas H. Grainger, Jr. 210 pages, indexed. The Ronald Press Co., New York. 1958. $4.50.

"Why study the history of science" provides an excellent introductory chapter to this book. In it the author clearly points out the complete neglect or, at most, superficial coverage of the historical aspects of science. As he puts it, "in this so-called age-of-science, history is taught seemingly about everything but science." Using the history of bacteriology as an example of one which has been sadly neglected, the author then presents a guide which certainly will provide stimulation for anyone who is interested in bacteriology.

The guide consists of a selected list of reference sources and is designed especially to stimulate interest in and an appreciation of the history of bacteriology. The selective annotated bibliography is divided into four parts: (1) literature of bacteriology, including general references on all sciences, and references on bacteriology, (2) history of bacteriology with special reference to specific areas, e.g., actinomycetes, air, animals, bacteria, food, (fifty-three headings), (3) bibliographical references to bacteriologists, and (4) a selective guide to biographies of sixty outstanding bacteriologists.

The value of this book depends necessarily upon the selectivity done by the author for references included or excluded. Without question he had done a splendid job. The book will be of value and aid to research workers, librarians, bibliographers, and students as well as to any person who becomes interested in biology, particularly in some phase of bacteriology.

CLARK T. ROGERSON

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PLANT BREEDING AND CYTOGENETICS. Fred C. Elliott. 395 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1958. $8.50.

The author well fulfills his purpose of providing a specialized text of value mainly to advanced students and practicing breeders. This book is an excellent guide to recent literature and gives deserved attention to fundamental genetical questions that may be neglected by the breeder only at high cost. The book is recommended for its integrative value as an addition to the plant breeding research library and for the stimulation it should offer to the graduate student.

A sample is submitted here of critical responses to certain controversial portions of the text. Favorable remarks should far outweigh adverse criticism, but this approach in review may serve to illustrate the content and vigorous nature of this book.

In stating that "the essence of a genetic system" is "the rate at which variation is released through recombination in each new generation," the author represents an extremely narrow view. Here, if not generally, genetic control of physiology and development is ignored. Elsewhere, it is concluded that "position effect . . . implies that the expression of a character is governed by interactions . . ., rather than by the discrete effects of the loci themselves." The expression "governed by" is too strong; a better choice of terms might be "is frequently *partially dependent* upon" interactions. Neither does it seem rigorously true that "natural selection . . . favors types which are near the mean for any characteristic."

In addition, issue may be taken with the conclusion that "it now appears likely that most mutations result from rearrangements within the chromosome." Further, the implication is not justified, generally, that mutations occur infrequently in homozygotes but that in "heterozygous material the spontaneous-mutation frequency may be relatively high." A more careful distinction should be made between the frequency of an event and the frequency with which it may be readily detected. Factual demonstration does not permit ready concurrence, either, with the summary that McClintock's dissociation-activator system in maize is "composed of two extra-genic elements." At still another point, alien chromosome addition races apparently are neglected in stating that plants "with a single extra chromosome are trisomes."

Furthermore, it is questionable that simply inherited forms of high resistance to disease "may be overcome by new mutants" (of infectious organisms) "quite readily." Rather, the outcome should depend strongly upon the basic physiological nature of the inherited resistance, which need not be simple, physiologically or genetically, despite simple Mendelian behavior in particular crosses.

The text also lacks critical evaluation in its unduly poetic prognosis for breeding programs by induced-mutation. Also, the book follows an expeditious but shortsighted line for the breeder, at one point, adhering closely to the economics of marketing. Optimal "sizes, shapes and other characteristics" of fruits and vegetables and "vigor, uniformity, and ultimate yields" are mentioned as breeding criteria. But certainly for broader service, additional breeding emphasis should be placed upon commonly neglected quality characteristics appreciated specifically on the consumer's table.

These remarks are severely selected, and certainly constitute relatively minor critical reservations to a complimentary judgment. Indeed, the possibility of such discussion is assured by Elliott, who intentionally has included speculative material in the text.

SEAWARD A. SAND
Genetics Department
Connecticut Agricultural Experiment Station

DISEASES AND PESTS OF ORNAMENTAL PLANTS. Pirone, P. P., B. O. Dodge, and H. W. Rickett. 775 pages, illustrated, indexed. The Ronald Press Co., New York. 1960. $10.00.

In recent years much emphasis has been given to ornamental plants and the insects, diseases, and physiogenic troubles that produce unsightly, weakened, and often dead trees, shrubs, flowers, and grass. In this regard, the first two editions of this book have proved to be of great interest and use to amateur and professional gardeners, and to students. But with copious new information being found by research workers and others on diseases and insects and especially on new and improved methods of control, a compilation of this widely scattered information is a necessity. Dr. Pirone has carefully prepared this third edition to fulfill

the need of disseminating up-to-date information on pests and insects to all who are concerned with ornamental plants and especially with the diagnosis and treatment of the many maladies to which these plants are subject.

Dr. Pirone has made extensive use of information available in recent literature, although he has not listed any selected references with each topic which, in itself, would make this volume lengthy and costly, but at the same time more valuable as a text for students. He has written from his many years of experience as a phytopathologist at Cornell and Rutgers universities and as a consultant with The New York Botanical Garden. With this backgound, the senior author has been able to use the original editions by Drs. B. O. Dodge and H. W. Rickett, well-known pathologist and botanist, respectively, as his nucleus, his own and other recently published information as the cytoplasm, and over two hundred well-reproduced clear figures as the other cell inclusions. The cell walls are the good-quality paper, binding, and hard covers supplied by The Ronald Press Co., that are essential (in this age of paper covers and pulpy pages) for a reference book which will find frequent use.

The first portion of this comprehensive guide to pests and diseases of ornamental plants, or about one-sixth of the book, serves as a well-illustrated introduction about the causes of plant troubles and the symptom types, a well-founded understanding of which is necessary to diagnose adequately. Part I introduces the gardener to blotches, blights, beetles, bugs, and bagworms which beset him. Important emphasis is given in the early pages to the environmental conditions and cultural practices that are responsible for a good portion of the "symptomatic plants" which we encounter. The causes of plant diseases—fungi, bacteria, viruses, and nematodes are more than adequately discussed for the gardener and homeowner.

Insect classification, the more common insect pests and miscellaneous animal pests, including mighty important mites, are covered in Part I. Brief portions are given about the important diagnostic aids of recognizing insect injury types and patterns. Chapter 4 on "Control" is one of the most important portions of this third edition, since it brings one up-to-date on many of the new insecticides, fungicides, and nematocides. It should give the gardener information on *why* and *what* he is using or can use to combat diseases and insects. Dr. Pirone has also indicated in this chapter that there are many other control methods for diseases and insects other than the use of chemicals.

Part II, the greater portion of this authoritative guide, is an encyclopedia of information on diseases and pests of nearly five hundred ornamental plants. Dr. Pirone discusses most of the diseases and pests of ornamental plants regardless of their prevalence and importance. The symptom descriptions and control recommendations are nontechnical. This allows the book to be of much more value to the gardener than to the student. The alphabetical arrangement of material according to genera from *Abelia* to *Zinnia* found in the earlier editions has been followed. Even though this may mean that one must become familiar with scientific names, it has the value of making this a time-saving, ready-reference dictionary of diseases and pests.

This well-organized guide book of diseases and insects of ornamental plants should prove to be a valuable sourcebook to amateur and professional gardeners and to those concerned with the planting and maintenance of trees and shrubs. It may serve as a supplementary reference to the student.

STEPHEN BACHELDER
Lecturer in Plant Pathology
Rutgers University
New Brunswick, New Jersey

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MIOCENE FLORAS OF THE COLUMBIA PLATEAU. Ralph W. Chaney and Daniel I. Axelrod. Quarto, viii 237 pp., indexed, illustrated, 44 pls. Carnegie Institution of Washington (Contributions to Paleontology) Publication 617, 1959. Paper, $4.25; cloth, $4.75.

The authors present a comprehensive summary of Miocene floras within the highly fossiliferous Columbia Plateau of Washington, Oregon, California, and Idaho. Chaney and Axelrod, known as the most active exponents of western North American fossil floras and their historical and paleoecological interpretation, have contributed an invaluable addition to the already voluminous literature on this subject. The book is another indispensable piece in the puzzle of correlation toward the establishment of age relationships, recognizable botanical provinces, evolution, migration, and a continued trend toward modernization, leading eventually to the Recent flora.

More specifically the authors discuss and correlate such floras as the Latah, Republic, Grand Coulee, and Spokane from Washington; the Mascall, Blue Mountains, Stinking Water, Succor Creek, and Trout Creek floras from Oregon; the Thorn Creek, Payette, and Lower Idaho floras from Idaho; and the Upper Cedarville, Weaverville, Remington Hill, San Pablo, and Table Mountain floras from northern and northeastern California. These floras display equivalents to modern temperate forests in eastern North America and northeastern Asia, and indicate topographic diversity, changes of precipitation, and finally the extinction of most of the East Asian and East American elements. Paleobotanical "direct" evidence is used exclusively as the basis for reasonable interpretation of all relationships cited and is presented in forty-four plates containing 431 excellent figures of pertinent localities and foliar structures. This evidence is augmented by thirty-two tables, a thorough systematic revision of the Miocene flora of western North America that affects approximately seven hundred described specimens, and a list of rejected species. A voluminous bibliography of one hundred and ninety references enables the reader to expand his horizon of direct and peripheral studies of Miocene floras.

As an indispensable work for all students who are cognizant of Tertiary paleobotany, the book presents a thorough, forceful, and convincing summary of Miocene floras with age relationships in their proper perspective that can be accepted as the last word based on the most competent research.

HERMAN F. BECKER

PRINCIPLES OF PALEOBOTANY, 2nd ed. William C. Darrah. 295 pp., indexed, illustrated. The Ronald Press Co., New York. 1960. $6.50.

Darrah's first edition of *Principles of Paleobotany* (1939) was subject to severe, general criticism regarding choice of subject matter, accuracy of contents, and the freedom with which the author quoted at great

length from other authors without acknowledging the source. Within the framework of relative brevity of the second edition, many of these shortcomings are alleviated.

The content follows a conventional arrangement of discussions on principles, history, techniques, the early plant record through Cenozoic floras, the origin of the existing flora, pollen analysis, evolution and phylogeny. Randomly selected inaccuracies of the first edition are largely corrected, but a few glaring errors have remained. Consistency in proper presentation in Tables 2-5 of age relationships for geologic sequence, cultural and historical changes, sequence of floras or sequence of genera and species within a time period, should have been maintained in that it is customary to place the earliest (oldest) events on the bottom as was properly done in Tables 1 and 10-12.

While the chapter on pollen analysis, if short, is a welcome addition, the chapter on Tertiary paleobotany should not have been cut from twelve to eight pages, but rather expanded. From a strictly evolutionary and taxonomic point of view, and closely relating to our modern flora, the vast accumulations of Tertiary plants, the great number of regional, distinct, epochal floras, offer a far-reaching opportunity for the interpretation of ancient climates, migration, evolution, and ecology. In order to stimulate prospective students, these aspects of the Tertiary ought to be a major concern of a text. Classical work in this respect by R. W. Chaney, E. Dorf, and D. I. Axelrod is negligibly treated if not ignored. A bibliography, usually indicative of the thoroughness in research, should be extensive since the prospective reader and student must be given not only a choice, but an overview of the field as a whole. In this respect, a short chapter on the prevailing journals and other literature dealing with paleobotanical aspects would have been appropriate. Many important works were apparently not consulted, or are, at least, not cited. One of the references omitted, without which basic progress in modern paleobotany is greatly hampered, is Oliver LaMotte's *Catalogue of Cenozoic Plants of North America through 1950.* This work saves untold time and effort in preparing the foundation for all paleobotanical research, namely identification of specimens upon which the interpretation of Tertiary events is based.

Generally speaking, the book is superior to its first edition, but appears to lack a certain thoroughness and the infallible competence that is expected in a text. One cannot but help compare the book with a similar, widely used text by Chester A. Arnold (1947) of which a second edition is now in preparation. In all probability Arnold's revised edition will remain the leading text of paleobotany in this country.

HERMAN F. BECKER

PLANT PATHOLOGY: Problems and Progress, 1908-1958. C. S. Holton, G. W. Fischer, R. W. Fulton, Helen Hart, S. E. A. McCallan, (ed. by). 588 pages, illustrated, indexed. University of Wisconsin Press, Madison, Wisconsin. 1959. $8.50.

Here is ample proof that the science of plant pathology has come of age. It contains important papers contributed by fifty-one of the world's leading authorities in pathology and related fields to help celebrate the fiftieth anniversary meeting of the American Phytopathological Society at Bloomington, Indiana, in August 1958. The articles are of interest not only to plant pathologists but to geneticists, plant physiologists, and biochemists. Although most of the articles are too technical for amateur gardeners, this volume will no doubt fall into the "required reading" category for plant pathologists and others working in related fields.

P. P. PIRONE

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GREEN UNIVERSE. Dolan, Edward F. Jr., 244 pages. Dodd, Mead and Co., New York. 1959. $3.50.

Mr. Dolan has written a colorful, fast-moving biography of the German naturalist, Alexander von Humboldt. From the time Alexander and his partner, Aime Bonpland, sailed for the New World on June 5, 1799, the reader is caught in the excitement of their adventures on the Orinoco in northern South America; in Cuba; in Mexico; in the United States. This reader found von Humboldt's meetings with Thomas Jefferson particularly warming. Things slow down a bit when von Humboldt returns to Europe many years later but only so that he may write of his experiences.

Anyone with a bit of adventure in his restless soul will enjoy *Green Universe.*

BERNICE WINKLER

THE CONTROL OF GROWTH AND FORM. Wigglesworth, V. B. 140 pages—illustrated, indexed. Cornell University Press, Ithaca, New York. 1959. $3.00.

Dr. Wigglesworth has been able to construct, from a series of lectures given at Cornell University, a short and interesting book. He has written what amounts to a good review of the molting phenomenon of insects. The student of insect physiology will find this a helpful guide and adjunct to the literature of hormonal control of metamorphoses.

GEORGIA E. MANOS

NEWS, NOTES and COMMENTS

Reception for Graduates at the Garden. The terrace at the Snuff Mill, along the Bronx River, furnished a delightful setting on the evening of June 21, 1960, for the reception tendered the graduates in the Two-Year Courses in Botany and Practical Gardening. T. H. Everett, Assistant Director (Horticulture) and Curator of Education, introduced Dr. George L. McNew, Managing Director of the Boyce Thompson Institute for Plant Research Inc., to the graduates, their relatives, and other guests. Dr. McNew's address on "Molecules in the Life of a Plant" appears on page 193 of this issue.

Mrs. Hermann G. Place, Vice President of The New York Botanical Garden, presented certificates to the graduates: in the Two-Year Course in Botany — Agnes B. Davis, Robert Russo, Genevieve W. Senber, Esther Streifus, and Morton A. Waldman; in the Two-Year Course in Practical Gardening — Abbie Bromley, Phyllis Bruno, Marcello Candia, William Cahill, Helene de Roetth, Mae G. Greene, Matthew Kabriski, William F. Korker, Joseph L. Owades, Polly Schinman, Henry Sitterman, and Theresa R. Waterman.

Activities of the Director and Staff. During the past several months, Dr. William C. Steere, Director, attended a panel meeting in New York City of the American Cancer Society at which funds were appropriated for research projects at universities and colleges; a meeting of the National Research Council on international meetings and Congresses in the biological sciences and a meeting of the Board of Directors of the American Horticultural Society, both in Washington, D. C.; and the annual meeting of the Board of Directors of the Bayard Cutting Arboretum at Oakdale, Long Island.

Dr. Steere, accompanied by Mrs. Steere, spent the month of July on a field trip in northern Alaska to study and evaluate arctic mosses. The trip was made under a grant from the Arctic Institute of North America.

Yuki Nobu Kuwahara, who is working for his doctorate at Columbia University, is assisting Dr. Steere under the latter's grant from the National Science Foundation for the study of Arctic American mosses. Mr. Kuwahara received his M.S. in bryology at Miami University, Oxford, Ohio, under Dr. H. A. Miller of the Department of Botany. Dr. Miller was a student of Dr. Steere at the University of Michigan.

T. H. Everett, Assistant Director (Horticulture) and Curator of Education, and Louis P. Politi, Horticulturist, visited the Arnold Arboretum, Jamaica Plains, Massachusetts.

Dr. Annette Hervey, Research Associate, is teaching a course in general botany at Hunter College during the summer session. Dr. Hervey taught a course in microbiology at Hunter College two evenings a week during the last semester under the Teacher Education Program.

Dr. David J. Rogers, Curator of Economic Botany, returned from his Jamaican and Brazilian trip, made on behalf of UNICEF, with frozen samples of foliage of twenty varieties of *Manihot esculenta* (cassava or tapioca-plant) for testing purposes to determine the nutritive value in the hope of finding desperately needed protein supplements for the diets of under-nourished children. Cassava, which is already used for its starchy roots, may provide a ready source of protein in its leaves.

The Animal Wildlife Institute asknowledges assistance received from Dr. Marjorie Anchel and Dr. Alma Barksdale, Research Associates, Charles C. Clare, Jr., botanical artist, Dr. Richard M. Klein, Alfred H. Caspary Curator, and Dr. Rogers in the preparation of *Humane Biology Projects.* Publication of this manual was made possible by the Ingram Merrill Foundation.

Dr. Klein has been elected a member of the Council of the new Society for Cell Biology; he represents The New York Botanical Garden through his curatorship and the Botanical Society of America through his membership in the Growth Development Section.

Dr. P. P. Pirone, Plant Pathologist, and Dr. Hervey showed the Garden's facilities to a group of almost one hundred members of the New York Teachers' Association of Biological Sciences on their visit to the Garden this summer.

Miss Elizabeth Hall, Librarian, became the Sarah Gildersleeve Fife Research Librarian of The New York Botanical Garden on August 15, 1960. On the same date, James Daly assumed the duties of Administrative Librarian.

Members of the staff who plan to attend the joint meetings of biological societies sponsored by the American Institute of Biological Sciences at Oklahoma State University, Stillwater, August 28-September 1, 1960, are: Dr. William C. Steere with Mrs. Steere, Dr. Arthur Cronquist, Dr. Clark T. Rogerson, Dr. David J. Rogers, Dr. Richard M. Klein with Mrs. Klein. Dr. Klein will be chairman of the symposium on "Metabolic Activation in Cell Development" which is jointly sponsored by the Development Section of the Botanical Society of America and the American Zoological Society. Dr. Cronquist will introduce the symposium on Floras. Dr. Steere will present a paper on the "Progress in Arctic Bryology" before a session of the American Bryological Society and one on "A Taxonomic Tool" before the Botanical Society of America. He will also deliver the address at the annual banquet of the latter society.

Richard Haard, who was graduated in June 1960 from the University of Georgia with a B.S. degree in plant pathology, is assisting Dr. Clark T. Rogerson, curator of the Cryptogamic Herbarium in his study of the *Hypocreales* under the latter's grant from the National Science Foundation.

Ronald Peterson, who was awarded the Gertrude S. Burlington Scholarship in mycology the summer of 1959, was awarded the scholarship again in 1960. Working on a taxonomic survey of the aquatic *Hyphomycetes* in the New York City area, Mr. Peterson has engaged in field work this summer with headquarters at the Garden. This survey is part of Mr. Peterson's program for his doctorate at Columbia.

Dr. Trevor McMorris will join the staff of the Research Laboratory under Dr. Marjorie Anchel this month. Dr. McMorris received his B.S., in 1952 and his M.S., in 1954 from London University. From 1954-57 he was Assistant Lecturer in Chemistry at the University College of the West Indies and during those years did research toward his doctorate which he obtained in 1958. In October 1957 he worked with Prof.

On June 24, 1960, Mr. and Mrs. Hermann G. Place entertained members of the Garden's staff at their home in Millbrook, New York. Photographed with Mrs. Place (right) are Mrs. John W. Donaldson and Dr. William C. Steere. Mrs. Place is Vice President of The New York Botanical Garden and chairman of the very successful drive for funds for the new library wing.

B. Lythgoe at Leeds University on an Inter-University Council Fellowship; a year later he moved on the same fellowship to Imperial College where he worked with Prof. D.H.R. Barton. Dr. McMorris comes to the Garden from the Department of Chemistry of the University of Western Ontario, where he has been working with Dr. Paul de Mayo on a N.R.C. Fellowship.

Theodore M. Barkley, who has been a graduate student assistant in the Herbarium under Dr. Arthur Cronquist, Curator, while he was working for his doctorate, was awarded his Ph.D by Columbia University on June 27, 1960. Mr. Barkley's thesis was "A Revision of *Senecio aureus* Linn., and Allied Species." Dr. Barkley has accepted a position as instructor with the Department of Biology at Occidental College, Los Angeles, California.

Thomas P. Pirone, eldest son of Dr. P. P. Pirone, received his Ph.D in plant pathology at the University of Wisconsin, Madison, Wisconsin, on June 6, 1960. He recently accepted the position of assistant professor in the Department of Plant Pathology at the University of Louisiana, Baton Rouge.

Newbold Morris was appointed Commissioner of Parks of the City of New York by Mayor Wagner. Mr. Morris succeeded Robert Moses, who had held the office for more than twenty-five years, and assumed his duties the latter part of May 1960. He has long been interested in municipal affairs and was particularly active when La Guardia was mayor. Mr. Morris, whose family is one of the city's oldest, is a member of the law firm of Lovejoy, Morris, Wasson, and Huppuck. He is active in the affairs of the Park Association of New York City. As Park Commissioner, Mr. Morris is an ex-officio member of the Board of Managers of The New York Botanical Garden.

Dr. James E. Canright, Associate Professor of Botany, Indiana University, will engage in research on primitive families of flowering plants in the Malaysian region, under a 1960-61 Guggenheim Fellowship. His centers of operation will be the Botanic Gardens at Bogor and the Singapore Botanic Gardens.

Dr. Thomas G. Pridham has received the U. S. Department of Agriculture Superior Award and Silver Medal for his contribution to the identification and classification of microorganisms in the Actinomycetes. Dr. Pridham, a microbiologist in the Fermentation Laboratory at the Northern Utilization Research Development Division, Peoria, Illinois, conducted his investigations as part of the research program of the Agricultural Research Service of the U. S. Department of Agriculture.

Dr. Donald F. Jones, who retired on June 30, 1960, after serving forty-five years on the staff of the Connecticut Agricultural Experiment Station, spoke on hybrid corn at the Station's "Research on Parade" field day, August 10, 1960. Dr. Jones is well qualified to tell the story of hybrid corn, the product of genetic research that contributes so much to the agricultural abundance of this country. Forty-three years ago, in an experimental plot at Mt. Carmel, Connecticut, Dr. James made the double cross of four inbred lines of corn. This technique, and his explanation of hybrid vigor, set the stage for the practical production of hybrid corn. Dr. Jones is a member of the National Academy of Science, and his work has been recognized by many organizations including the Botanical Society of America.

This area at the entrance to the home of Mrs. John W. Donaldson in Millbrook, New York, features small rare wildflowers that like acid soil.
Mrs. Donaldson, a member of the Committee on the Native Plant Garden that is being created at The New York Botanical Garden, has contributed a substantial gift toward the development of this garden and also generously donates fees from her lecture on "Wildflowers, a Neglected Element in Garden Design."

Dr. Doyle E. Peaslee has been appointed to the staff of the Connecticut Agricultural Experiment Station and will investigate methods of testing soils for plant food elements. He will begin with an examination of tests for calcium. The Morgan soil-testing system, that was developed by the Station and is used in more than twenty countries, relies upon an extracting solution which imitates the action of plant roots in drawing nutrients from the soil. Sometimes the amount of calcium available to the plant may be inaccurately estimated by this system. A fairly exact estimate of calcium availability is critical for growers of such plants as tobacco, potato, and laurel which require relatively large amounts of calcium but are injured by excess lime.

Paul Mason Tilden has succeeded Bruce M. Kilgore as Editor of *National Parks* magazine. Mr. Tilden was Assistant Editor of *Nature Magazine* until its merger in January 1960 with *Natural History,* when he became Associate Editor of the latter. Mr. Kilgore is now Managing Editor of the expanded publishing program of the Sierra Club, San Francisco, California, and of the *Sierra Club Bulletin.*

The International Society for Horticultural Science was officially organized in March 1960 at The Hague, The Netherlands. Eighteen member countries were represented at the meeting. Dr. A. B. Lecrenier of Belgium was elected President; Dr. H. B. Tukey of Michigan State University, Vice President; and Dr. G. deBakker of The Netherlands, Secretary-Treasurer. The next International Horticultural Congress is scheduled to be held in Brussels, Belgium, in September 1962.

Plant Hardiness Zone Map, a publication of the Agricultural Research Service, U. S. Department of Agriculture, may be had from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 15c per copy. This fine hardiness map and the accompanying lists of plants as "indicators of the cultural possibilities of each zone" will be useful to all growers—amateurs, commercial, and professional.

It was prepared by Dr. Henry T. Skinner, Director of the U. S. National Arboretum, as chairman of a commission of the American Horticultural Council (now the American Horticultural Society) which conducted studies on winter hardiness of ornamental plants. These studies were made on the recommendation of the American Association of Nurserymen.

American Institute of Biological Sciences Translation Program. The American Institute of Biological Sciences is currently translating and publishing seven Russian research journals in biology. These journals are translated with support from the National Science Foundation, which is eager that such information be more widely distributed to biologists throughout the world. It is hoped that this material will aid biologists in research, prevent duplication of work, give some idea of the work being done by Soviet scientists in the field of biology, and also bring about a better international understanding among scientists.

Because of the support of the National Science Foundation, the AIBS can offer these translations at a fraction of their publication costs, with even further price reductions to AIBS members and to academic and non-profit libraries. This reduction

places the translation within the reach of all biologists.

The journals currently being translated are *Doklady*: Biological Sciences Section; *Doklady*: Botanical Sciences Section; *Doklady;* Biochemistry Section; *Plant Physiology, Microbiology; Soviet Soil Science;* and *Entomological Review.* The AIBS has also instituted a separate program of translation and publication of selected Russian monographs in biology. It was felt that the program of journal translations was not sufficient to cover all the significant work being done in all fields of biology by Russian scientists. With the aid of competent authorities, the AIBS has translated and published six Russian monographs and one monograph is in the process of being published. In addition, several prominent monographs in various biological areas are being considered by the AIBS and the National Science Foundation for translation and publication.

The monographs that have been published are *Origins of Angiospermous Plants* by A. L. Takhtajan; *Problems in the Classifications of Antagonists of Actinomycetes* by G. F. Gauze; *Marine Biology,* Vol. XX, *Trudi:* Institute of Oceanology, edited by B. N. Nikitin; *Arachnoidea* by A. A. Zakhvatkin and *Arachnida* by B. I. Pomerantzev. The manuscript for "Plants and X rays" by L. P. Breslavets is in the final stages of preparation and should be published early in 1960.

Additional information about this program may be obtained by writing to the American Institute of Biological Sciences, 2000 P Street, N. W., Washington, D. C.

The National Wildlife Federation and state affiliates offer scholarships and fellowships to qualified individuals who are studying in the field of conservation and conservation education. Appropriate activities include resource management, teacher training, curriculum problems, textbook development, radio and television, scouting and conservation, farmer-sportsmen relations, conservation workshop techniques, state programs, and journalism. For application blanks and further information on James Hopkins scholarships for undergraduate students up to $500, graduate student fellowships up to $1,000, and post-graduate fellowships or special project grants up to $1,000, write before November 1, 1960 to Executive Director, National Wildlife Federation, 1412 Sixteenth St., N. W., Washington, D. C.

Panel on Food Additives. Dr. Detlev W. Bronk, President of the Rockefeller Institute for Medical Research and of the National Academy of Sciences, served as chairman of a panel of nine experts who were called upon by President Eisenhower's Science Advisory Committee to study and report on the use of additives in producing and processing food. Among the other panel members were Dr. J. George Harrar, Vice President of the Rockefeller Foundation, Dr. Harold C. Hodge, Professor of Pharmacology and Toxicology of the University of Rochester, Dr. James H. Horsfall, Director of the Connecticut Agricultural Experiment Station, and Dr. C. N. Hugh Long, Sterling Professor of Physiology of Yale University.

The panel recommended that the U. S. Secretary of Health, Education, and Welfare appoint a board of scientists to assist him in evaluating scientific evidence on the basis of which decisions may be made in permitting or prohibiting the use of certain chemical food additives.

Fifteenth American Horticultural Congress will be held November 10-12, 1960, with headquarters at the Huntington-Sheraton Hotel, Pasadena, California. Dr. G. W. Beadle, Nobel Laureate and Dean of Faculty, California Institute of Technology, will be the speaker at the President's Dinner on the first evening after a tour of the Huntington Botanical Gardens.

The second day will be spent at the Los Angeles State & County Arboretum, Arcadia, and the morning of the last day will be devoted to a tour of nurseries in the area.

Dr. David Davis will pursue research on the physiology of selective pathogenicity in *Fusarium* in the Research Laboratory. Dr. Davis comes to the Garden from Merck, Sharp and Dohme where he has been plant pathologist since 1955. Dr. Davis obtained his doctorate from the University of Illinois in 1950. From 1950-55, he held a post-doctoral fellowship in the Crop Protection Institute at the Connecticut Agricultural Experiment Station.

Dr. Lee W. Lenz, Director of Rancho Santo Ana Botanic Garden, Claremont, California, will return shortly from his six-month leave from the Botanic Garden for travel and study in Europe. While in Portugal, Dr. Lenz collected *Iris subbiflora,* authentic material of which is rare in cultivation. He also visited the villa belonging to the Campo Bello at Oporto in order to see what may be the oldest and largest specimens of camellias in the western hemisphere. The trunks of the largest measure eighteen to twenty-four inches in diameter, and they are almost thirty feet tall. Records indicate that the plants were brought to this villa from Japan about 1550.

Visitors to the Garden. The following have visited The New York Botanical Garden within recent months:

Dr. Henry K. Svenson, Washington, D. C.
Fred Cassebeer, Nyack, N. Y.
Mr. and Mrs. Kenneth Smith, Dongan Hills, Staten Island.
Mr. and Mrs. F. P. Walter, Upper Montclair, N. J.
Mr. and Mrs. Ira Woods, New Providence, N. J.
Philip Alampi, Secretary of Agriculture, State of New Jersey, Trenton, N. J.
Kenneth Bobronsky, Bronx Science High High School, New York, N. Y.
Richard Staples and
R. Syawananda and
Joyce Bado, Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y.
Miss Suzanne Bourgeois and
Dr. Jean-Marie Wiame, University of Brussels, Belgium.
Father Sebastian Girzone, O. C., New York, N.Y.
Dr. Raymond J. Bannister, Dept. of Pharmacy, University of Saskatchewan.
Father J. Dundon, St. Louis University, St. Louis, Mo.
Robert B. Gambino, Westchester County (N. Y.) Agricultural Agent.
Dr. Trevor McMorris, University of Western Ontario, London, Ont.
Dr. H. Potter, Michigan State University, East Lansing, Mich.
Dr. Kathe Schwarz, Instituto Biológico, São Paulo, Brazil.
Dr. Jennie Simpson, Hunter College, New York, N. Y.
Dr. Frits W. Went, Director, Missouri Botanical Garden, St. Louis, Mo.
Joseph Swan, Farmington, Conn.
Gordon Wasson, New York, N. Y.
Dr. Lyndon O. Brown, Bronxville, N. Y.
John B. Gambling, Oldfields, N. J.
Sir Joseph Hutchinson, United Nations.
Newbold Morris, Commissioner of Parks, New York, N. Y.
Charles B. Harding, Rumson, N. J.
Mrs. Hermann G. Place, Millbrook, N. Y.
Lewis Anderson, New York, N. Y.

BOOK REVIEWS

ANATOMY OF SEED PLANTS. Esau, Katherine. 376 pages, illustrated, indexed. John Wiley and Sons, Inc., New York. 1960. $6.95.

Anatomy of Seed Plants is not merely an abbreviated version of the author's earlier *Plant Anatomy.* It is an up-to-the-minute, balanced, scholarly treatment of a subject which has grown by leaps and bounds within the last decade, by the one most eminently qualified to present it.

The first thirteen chapters deal with the types of cells and tissues in seed plants, and with the embryo; in the next nine chapters root, stem, leaf, flower, fruit, and seed are considered. Fewer developmental details and less historical background are included than in the earlier volume, but the discussions are clear, terse, and modern. Each chapter ends with a relatively short list of mostly recent, significant references, and the index

Dr. Ernest Guenther, Vice President of Fritzsche Bros., New York City, (left) gave the presidential address at the dinner of the Society for Economic Botany on May 21, 1960. Dr. C. O. Erlanson, Chief, New Crops Research Branch, U.S.D.A. Agricultural Research Section, Beltsville, Maryland, (center) is Chairman of the Society's Council; and Dr. David J. Rogers, Curator of Economic Botany at The New York Botanical Garden, (right) is Chairman of the Society's Program Committee.

BOOK ORDERS

Books reviewed in *The Garden Journal* or any other book on botany, horticulture, nature study, conservation, flower arranging, or kindred subjects may be ordered through Book Service.

Members are entitled to 10% discount on the list price.

When you place an order for books, please send check or money order, made out to

The New York Botanical Garden, to Book Service.

is preceded by an exceedingly helpful glossary.

A limited number of the illustrations have been taken from the earlier book, but many are new and the rest have been carefully culled from publications of the last few years.

The *Anatomy of Seed Plants* ties this vast subject together in a neat, new, crisp package; in the usual Esau tradition, it is a masterpiece.

EDWIN B. MATZKE
Department of Botany
Columbia University

LIGHT AND PLANT GROWTH. Van der Veen, R. and G. Meijer. 161 pages—illustrated, indexed. The MacMillan Company, New York. 1960. $8.50.

This book discusses the various aspects of the influence of light on plants. Photosynthesis, phototropism, and photoperiodism are discussed and set the stage for the ensuing study of the uses of light in horticulture. This book is concluded with a chapter on the design and use of artificial lights in horticulture.

Although well written, and for the most part clearly illustrated, this book is too advanced for the general reader. The practicing plant grower and the more advanced reader, preferably with some background in plant physiology, will find this book of interest. The data reported is recent, and the literature coverage wide; regrettably, the bibliography is very skimpy.

JACQUES LIPETZ

THE GARDENER'S WORLD. Krutch, Joseph Wood. 476 pages, illustrated. G. P. Putnam's Sons, New York. 1959. $8.95.

This is an extraordinary book. It is an anthology — and what, after all, is more suitable for persons interested in flowers? But what an anthology! Any book that can embrace between two covers Theocritus, Colette, Thoreau, Lewis Carroll, Darwin, Boccacio, and H. G. Wells merits some sort of medal. It is an assembly of selections from the literature of the western world that has to do with gardens or with plants in other aspects. (Asia, curiously enough, is not represented). The extracted passages are arranged in "sections" under such headings as "The pleasures of gardening," "Herbalists and early garden books," "Fashions in gardens," "The Linnaean age," and so forth. The compiler contributes an introduction and brief notes on the authors and their times.

This bespeaks a vast literary acquaintance; I had almost said a vast erudition — but a certain inaccuracy in details precludes such a title. Linnaeus' name was Carl, not Carolus nor Charles. The *title* of Parkinson's best-known work was not "Paradisi in sole paradisus terrestris" (as Krutch himself makes clear in another place). Francois André Michaux would be better so designated rather than by the "F. Andrew Michaux" that his Philadelphia publishers foisted on him. Nevertheless, he seems to be confused with his father André Michaux. And Nuttall added three, not two, volumes to Michaux's *North American Sylva,* the passage quoted being published in 1842, not 1849.

The book is not a credit to the American book designer. The type is well chosen, the page well designed; but the potentially charming illustrations (taken mainly from old books) are printed on paper of a repulsive yellow-green color which fights ferociously with the green of the cover. On the cover are three roses in various unhappy colors, which certainly add little to its attractions.

All in all, though, I am grateful to Krutch for introducing me to several authors of whom I had never heard and for giving me a wholly new and delightful aspect of Colette.

H. W. RICKETT

A DIDEROT PICTORIAL ENCYCLOPEDIA OF TRADES AND INDUSTRY. Diderot, Denis. 2 volumes. Indexed and illustrated—485 plates. Dover Publications, Inc., New York. 1959. $18.00.

The encyclopaedists of the eighteenth century, and Denis Diderot in particular, sought to bring together and make available to all the science and technology that were rapidly changing man's outlook on nature. In the famous *Encyclopédie* they also advocated democracy and represented the anticlerical currents of the time. The two present volumes contain only the plates dealing with "trades and industry"—including agriculture. Each plate is accompanied by an informative note by the erudite editor. The total effect is a vivid picture of the daily life of France in the period that preceded (and generated) the Revolution.

H. W. RICKETT

THE GENETICAL THEORY OF NATURAL SELECTION. Fisher, R. A. 284 pages, indexed, illustrated. Dover Publications, Inc., New York. 1959. $1.85.

A new issue of a standard work.

H. W. RICKETT

EXCURSION FLORA OF THE BRITISH ISLES. Clapham, A. R., T. G. Tutin, and E. F. Warburg. 579 pages, indexed. Cambridge University Press, New York. 1959. $4.50.

A condensed edition of the well-known *Flora of the British Isles* by the same authors.

H. W. RICKETT

A HERBAL OF ALL SORTS. Grigson, Geoffrey. 96 pages, illustrated. The Macmillan Company, New York. 1959. $2.50.

Another delightful work by the author of The Englishman's Flora. "This small Herbal . . . is about virtues medicinal, magic, supernatural, aesthetic, and treasure-trove; a personal notebook about plants, . . ." Plants are roughly in alphabetical order of common names, and there are articles on "Botanomancy" (if you don't know what that is, read the book!), "Fungal Snobbery," "Herb-Women," "Strewing Plants," "Unlucky Plants," and many other miscellaneous topics. I wish more poets would write on plants!

H. W. RICKETT

WILDFLOWERS, A NEGLECTED ELEMENT IN GARDEN DESIGN

A 45-minute lecture developed by Mrs. John W. Donaldson of Deep Hollow Farm, Millbrook, New York, for The New York Botanical Garden shows wildflowers planted in the designed garden, as well as in entrance and living areas around the house.

Moss, wild ginger, European ginger, and wintergreen ferns are used as borders.

The lecture emphasizes the necessity for expert propagation of our rare native plants to be introduced into horticulture in order that our gardens may become perpetual sanctuaries for our wonderful heritage of native plants.

The fee is $50, which is turned over to The New York Botanical Garden, for the development of the Native Plant Garden.

TREES OF THE SAN FRANCISCO BAY REGION. Metcalf, Woodbridge. 72 pages, illustrated. University of California Press, Berkeley, California. 1959. $1.50.

An illustrated, non-technical handbook for the layman.

ARTHUR CRONQUIST

NATURAL SELECTION AND HEREDITY. Sheppard, P. M. 212 pages, indexed. Philosophical Library, New York. 1959. $6.00.

A textbook-style presentation of "some recent ideas on the mechanism of evolution in the light of modern genetics," as simply written as the subject permits, and with two introductory chapters "explaining the elementary principles of heredity."

ARTHUR CRONQUIST

EDIBLE WILD PLANTS OF WEST VIRGINIA. Gillespie, William H. 118 pages, illustrated, indexed. Scholar's Library, New York. 1959. $2.50.

This booklet lists, by common and scientific name, over two hundred kinds of wild plants which can in some way provide food or drink for man, indicating the use and manner of preparation of each. The excellent line drawings are the only means of identification provided.

ARTHUR CRONQUIST

POCKET FIELD GUIDE TO TREES. Grimm, William Carey. 143 pages, illustrated, indexed. The Stackpole Company, Harrisburg, Pennsylvania. 1959. $1.50.

The book consists mainly of a series of excellent drawings of leaves, twigs, flowers, and fruits of trees of eastern United States, one species to a page, extracted from the author's *Book of Trees,* published in 1957.

ARTHUR CRONQUIST

FRUIT KEY & TWIG KEY TO TREES AND SHRUBS. Harlow, William M. 56 pages, indexed, illustrated. Dover Publications, Inc., New York. 1959. $1.25.

This new Dover edition first published

in 1959 is an unabridged and unaltered republication of the first edition of *Fruit Key to Northeastern Trees,* and the fourth revised edition of *Twig Key to the Deciduous Woody Plants of Eastern North America.* Both books are bound as one.

ARTHUR CRONQUIST

DRAWINGS OF BRITISH PLANTS — Part XIII. Ross-Craig, Stella. Illustrated and indexed. G. Bell & Sons, Ltd., London, England. 1959. 9s6d.

A series of beautiful, technically accurate line drawings. When finished, the series should be the definitive work in its field.

ARTHUR CRONQUIST

TAXONOMY OF FLOWERING PLANTS. Porter, C. L. 452 pages, illustrated, indexed. W. H. Freeman & Company, San Francisco, California. 1959. $6.75.

A well-illustrated elementary text, mainly Besseyan in approach, emphasizing selected orders and families.

ARTHUR CRONQUIST

A FLORA OF SOUTHERN ILLINOIS. Mohlenbrock, R. H., and J. W. Voigt. 390 pages, illustrated, indexed. Southern Illinois University Press, Carbondale, Illinois. 1959. $7.50.

A standard local flora, with keys and comments, "prepared for use by anyone having an interest in our native flora and who has had some introductory study of botany."

ARTHUR CRONQUIST

UTILIZATION OF NITROGEN AND ITS COMPOUNDS BY PLANTS. 385 pages—illustrated. Academic Press, Inc., New York. 1959. $9.50.

This volume presents the papers delivered at the Thirteenth Symposium of the Society of Experimental Biology held at the University of Reading from September 15-19, 1958.

ALMA W. BARKSDALE

PLANT GROWTH SUBSTANCES. 2nd Edition. AUDUS, L. J. 553 pages—illustrated, indexed. Interscience Publishers, Inc., New York. 1959. $10.00.

This is one of a series of Plant Science Monographs edited by Nicholas Polunin, designed to present detailed and documented surveys of scientific research pertinent to the feeding and clothing of man. In the present volume, the nature of plant auxins and their application to agriculture are discussed.

ALMA W. BARKSDALE

LETTERS TO THE EDITOR

I was most interested in the article on "Native Eastern Azaleas" in the May-June 1960 issue. The Southampton Colonial Society is developing a native woodland, in a small way, on its grounds. For months I have been trying to find the native azalea shrubs. Last week a local woman sent me a spray with the most beautiful pink to deep pink flowers; she did not know the name of this azalea. At last I found the plant in *Plants of Colonial* Days and now in this article in *The Garden Journal.*

The Southampton Garden Club has just completed an authentic, very beautiful seventeeth century herb garden—so you can see that we have historic interests as well as rose shows.

Thank you for listing our rose show in the "Calendar."

EDNA M. POTTER
(Mrs. John S. Potter)
Southampton, Long Island

I have visited Virginia and North Carolina and certain areas in Pennsylvania several times for the purpose of seeing the native azaleas. I shall now appreciate them all the more and understand why I have noticed variation in flower color on plants of the same species, after reading Mr. Leach's informative article in the May-June 1960 issue of *The Garden Journal.*

E. NOLTE
New York, N. Y.

MEMBERSHIP (from page 195)

Garden Club of Peekskill
Philipstown Garden Club
Plainfield Garden Club
Port Washington Garden Club
Pound Ridge Garden Club
Ridgefield Garden Club
Riverdale Garden Club
Rumson Garden Club
Little Garden Club of Rye
Rye Garden Club
Sasqua Garden Club
Scarsdale Garden Club
Secor Garden Club
Short Hills Garden Club
Somerset Hills Garden Club
Southampton Garden Club
Southport Woman's Club, Garden Dept.
Summit Garden Club
Syosset Garden Club
Three Harbors Garden Club
Tuxedo Park Garden Club
Vernon Heights Garden Club
Westport Garden Club
West St. Garden Club, Bell Telephone Laboratories
Garden Club of Yorktown

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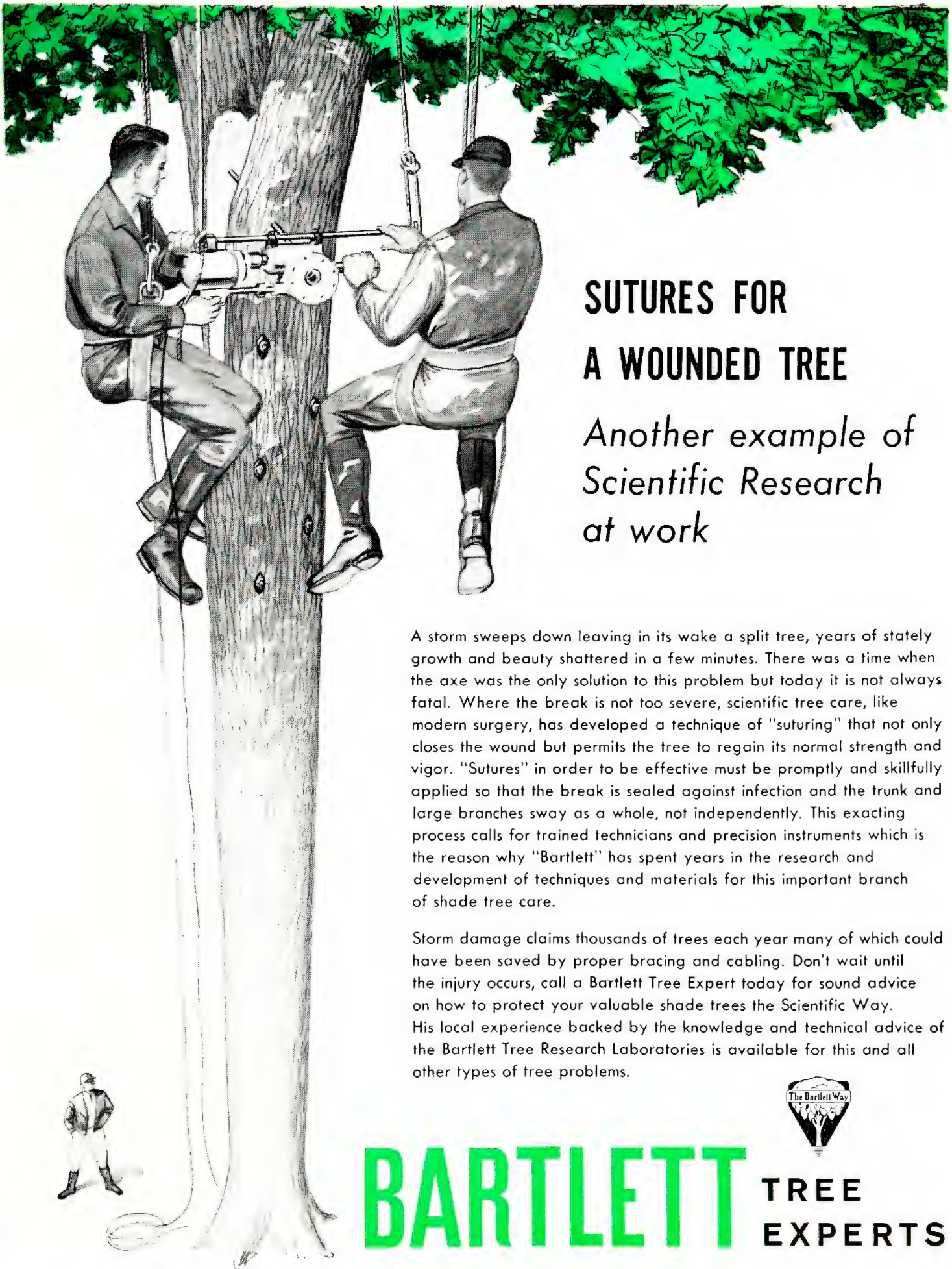

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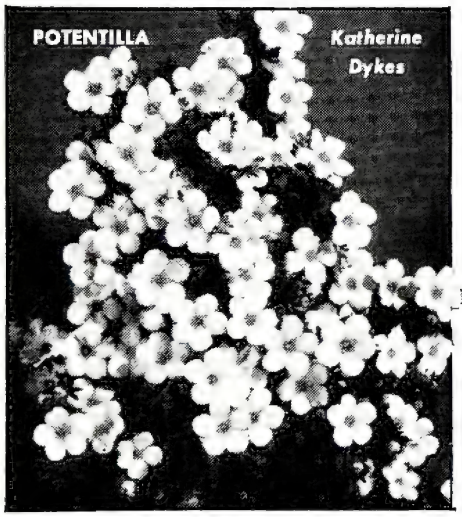

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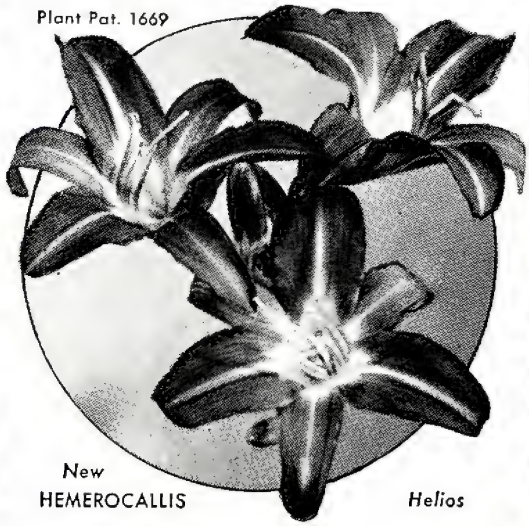

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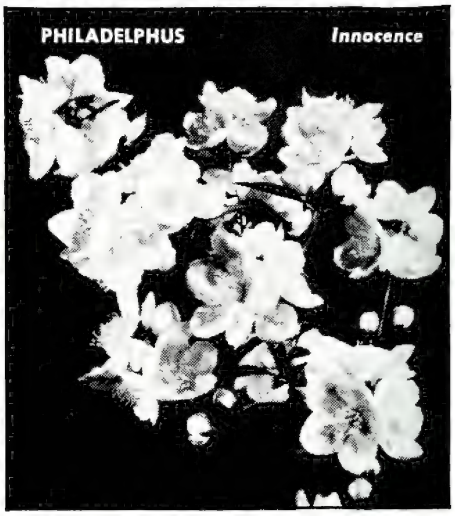

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Wayside Gardens

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

Vol. 10, No. 6 November-December, 1960

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

December 8, 1960. Annual Holiday House Tour sponsored by the Volunteer Associates of The New York Botanical Garden.

December 16, 1960. Christmas Show opens in The Conservatory of The New York Botanical Garden.

December 27, 1960. Special symposium sponsored by The Torrey Botanical Club, Hotel Biltmore, New York City. See page 242 this issue.

January 5, 12, 19, 26, 1961, 11 a.m. Downtown Lecture Series sponsored by the Volunteer Associates of The New York Botanical Garden. Mrs. John Fiske and Mrs. Marcus Fair, Co-Chairmen of the Committee on Arrangements.

January 9, 1961. Theater Benefit sponsored by the Volunteer Associates of The New York Botanical Garden; "Critic's Choice" with Henry Fonda at the Barrymore Theatre. Mrs. Marshall F. Dancy and Mrs. Oliver A. Vietor, Co-Chairmen of the Committee on Arrangements.

February 28, 1961. Reserve this date for Members' Evening of The New York Botanical Garden. Program will be announced later.

April 18-28, 1961. Third International Rock Garden Conference arranged jointly by Alpine Garden Society in London, with cooperation of the Royal Horticultural Society, and Scottish Rock Garden Club in Edinburgh, with cooperation of Regius Keeper, Royal Botanic Garden, Edinburgh.

April 22-29, 1961. Twenty-eighth annual Historic Garden Week in Virginia. Proceeds to be used towards completion of the gardens on the East Lawn of the University of Virginia.

May 4, 1961. Spring Garden Tour to Bucks County, Pennsylvania, sponsored by The Volunteer Associates of The New York Botanical Garden.

May 12-14, 1961. International Rhododendron Conference in Portland, Oregon, under the auspices of the American Rhododendron Society.

April 27-May 7, 1962. Floralies, International Horticultural Exposition, under auspices of Société d' Horticulture and Jardin Populaires de France, in Valenciennes, France.

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CREDIT FOR ILLUSTRATIONS

We are indebted to the Display Committee, Mrs. Charles Burlingham, Mrs. Richard S. Meredith, and Mrs. Donald B. Straus, for the selection of the front cover illustration—one of the tropical houses of the Conservatory of The New York Botanical Garden, photo by E. N. Mitchell; p. 206, The New York Botanical Garden; p. 210, E. N. Mitchell; p. 212, David J. Rogers; p. 213, Lincoln Adderley; p. 214, Howard W. Swift; pp. 215, 216, U. S. National Arboretum, pp. 218-220, T. H. Everett; pp. 221, 222, Joseph C. McDaniel; pp. 224-227, Brownell's Holly Farms; p. 228, **Gesneriad** Journal; p. 229, Figs. 3 and 5, Paul Arnold, Fig. 4, Peggie Schulz; p. 232, Gottscho-Schleisner; pp. 239-242, E. N. Mitchell. Poinsettia, p. 207; pine, p. 208; American holly and mistletoe, p. 209, cardinal flower, p. 234, Charles C. Clare, Jr.

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Dr. Bernard Ogilvie Dodge passed away in St. Luke's Hospital, New York, in the evening of August 9, 1960. He was born in Mauston, Wisconsin, on April 18, 1872.

Dr. Dodge was Plant Pathologist at The New York Botanical Garden from 1928 to his retirement with the title of Emeritus in 1947. His outsanding researches in plant pathology, in mycology, and in genetics are well known.

Besides being an eminent scientist, Dr. Dodge enjoyed the warm affection of all who knew him; his colleagues at the Garden and elsewhere have suffered a personal loss.

"HOW COME"

Excerpts from Autobiographical Notes by the late Dr. B. P. Dodge.

"ONLY IN ONE of the many years of my father's long and active life did he keep a diary. That was the year of my birth, 1872. Back in colonial days it was a custom to record births, marriages, and deaths in family bibles, in church baptismal records, in the offices of county clerks or registrars of deeds. In some places such records are still preserved. However, when inhabitants of New England moved into the Middle West and farther, the settlers often neglected to preserve the records. My father's diary proved a valuable asset, since there are neither family nor county records of my birth and citizenship to be had, and anyone without such records applying for a passport or Social Security benefits in recent decades finds himself in an embarrassing position. The diary was accepted at the U. S. Passport Office in 1930 for a passport to travel in various countries in Europe. The Office of Social Security later accepted the diary and passport as proof of my birth and citizenship.

"The entry for Thursday, April 18, 1872, was brief: 'Son born . . . about 1 p.m.' When I asked my father if he would make me a present of the little book, he complied. He seemed to realize that the entry was not very informative, as he wrote just below: 'Apr. 22, 1900. The son referred to is yourself, Bernard Ogilvie Dodge. Your father, E. G. Dodge.'

"In order to understand how I came to make botany my life work, it should be recalled that in high school at Mauston, Wisconsin, the botany teacher, Mrs. Goetting (also English teacher, history teacher, and so forth), knew little about plants. Since it was only a three months' course—this was nearly seventy years ago—botany consisted mostly of learning how to analyze plants and give them specific names. We had very little knowledge about the lower forms of plant life, such as fungi, algae, or bacteria. Mrs. Goetting had each student collect in the wild at least seventy-five species of plants and identify them, following Gray's School and Field Botany Keys. We learned, along with other characteristics, about the arrangement of leaves but nothing about the spiral arrangement as related to the Fibonacci series of fractions, and this with logarithmic spirals and the Golden mean! These collections were presumed to be dried and pressed botanical specimens. For each twenty-five species more than the minimum seventy-five, we were given a higher grade. I ended up with a standing of 125!

"My interest in plants did not end on graduation day, June 10, 1892; but it was several years before I became interested in plants in general, especially the lower forms. One of my courses as an adult special student at the University of Wisconsin, in 1896, was with Prof. Charles R. Barnes who later went to the University of Chicago as professor of plant physiology. He had originally specialized in mosses, liverworts, and other lower forms of plant life.

"As teacher of botany at the Algoma High School, I became interested in types of plants that grow in swamps and woods. The liverworts were especially interesting, particularly after we had purchased a good microscope—one for the whole class of twenty or more students. They were fascinated to examine under the microscope such algae as *Spirogyra, Hydrodictyon,* and diatoms. The boys would come to the school-house in the evening, if they saw a light in the laboratory. They never knew what kind of show I was putting on! At first we had only a kerosene lamp to light the microscope—one of the stage footlights loaned by the Perry Opera Hall. I discovered on one of those evenings something I had never seen before and have never seen since; that was the process by which an antherozoid of a little leafy liverwort migrated down the neck of the archigonium and finally appeared to fuse with the egg.

"Some years later at Columbia University, I studied *Marsilia* to show the class in botany stages in fertilization. The antherozoids would swim into the jelly-like mass, but I could never find that they seemed to fuse with the egg in the archigonium. Later I learned that the species was said to be apogamous!

"While Principal of the Algoma High School, I taught botany and physics regularly and sometimes geometry. One afternoon I went into a swamp to collect *Spirogyra* and *Hydrodictyon* for classes the next day . . . Walking back home along a narrow dark road, I met an old Bohemian tailer . . . who had several curious things in his basket. I asked him what he had. He said, 'Pilze'. 'What are you going to do with them?' 'Gut für essen,' he replied.

"Here I was teaching botany, and I did not know what a common mushroom looked like. I found out later that he had specimens of a species often erroneously reported to be poisonous and not an edible mushroom at all—probably *Boletus luridus* or *B. satanus.* I never heard of any one in that region being poisoned by eating those *Boletus* 'toadstools.' The secret of this is probably that they knew from experience a few species that were safe, and avoided the ones they did not know 'for sure'.

"We had no books on mushrooms in the high school library, so I sent specimens to the Department of Botany at

the University of Wisconsin. Their reply was to the effect that a mushroom that turned blue when broken open was poisonous and so was a 'toadstool' . . . When I would give friends a basket of mushrooms from the wild, they would not touch them until they had been shown to Mr. Danek, Mr. Thiard, or Mr. Pauly, or some authority better than Dodge.

"Finally I was able to buy a book on mushrooms by Prof. George Atkinson of Cornell. Then Mrs. Dodge made me a Christmas present of MacIlvaines' *One Thousand American Fungi.* With these two books, I was able to identify a number of fleshy fungi. Some of the species had been dried and were later brought to Columbia University . . . where I registered in 1910 for graduate work on the fungi.

"Leaving Algoma in 1908 to attend the University of Wisconsin for one year in order to finish my studies for the Ph.D. degree, I prepared for my thesis a report on most of the species I had collected in Wisconsin mostly from Kewaunee County. This thesis was revised, added to later, and published in 1914. In all, over six hundred were listed with many comments.

"My contacts with such authorities as Heinrich Rehm of Munich, Bresadola of Austria, and Charles Peck, the famous New York State botanist, were factors leading to [my] future interest in the morphology, taxonomy, pathology, and genetics of the fungi.

"Some years ago I . . . [gave] the first annual address of the Mycological Society of America . . . on September 12, 1950. The title of the address was 'The Fungi Come Into Their Own.' The final sentence of the address was: So I shall wait around until this is done [until biochemists report on virus diseases of the fungi]; then I can say the old red bread mold has at last come into its own. No doubt bakers would have said: At last that pest has got what was coming to it. On the plus side of this account, it should be noted that a Nobel Prize was awarded in recent years jointly to three biochemical geneticists for their work, carried on, in large part, with this orange-colored mold, *Neurospora.*"

Bernard Ogilvie Dodge in his laboratory at The New York Botanical Garden

INSIDE PLANTS

By **Richard H. Bohning**

Dr. Bohning is Assistant Dean of the College of Agriculture and Home Economics and Associate Professor in the Department of Botany and Plant Pathology at The Ohio State University. The following is based on talks he has delivered during short courses at the University and to garden clubs in central Ohio.

PERHAPS A CONVENIENT way of learning something of what goes on inside plants is to plant a seed and trace step by step some of the events that occur as the tiny embryo within the seed resumes growth and develops into a mature plant with seeds of its own. Of course, many of the plants with which you are concerned develop from cuttings rather than from seeds, but whatever is said about the inner working of plants will be true whether the plant in question developed from a seed or from a vegetative propagule.

The seed that we take from the packet appears as lifeless as a pebble, but beneath the seed coat evidence of life can be detected if one will make the right kind of measurements. Respiration, the process in which food is oxidized and energy is released, is occurring at a very slow rate. Why then has the embryo stopped growing? Some say it is resting, or perhaps a better expression, because I doubt if it ever got tired, is that it is dormant. Many conditions within or without the seed have contributed to cessation of growth. By now the internal conditions should be favorable to the resumption of growth, but the environment within the packet is not the usual habitat of a germinating seed. So let's take the seed and place it in a well-prepared seed bed—now if it ever wanted to rest, this is the place to do so. But when we look closely at the seed, we notice that a remarkable change is occurring. As it lies there in the bed, the seed begins to get bigger or we say it begins to swell.

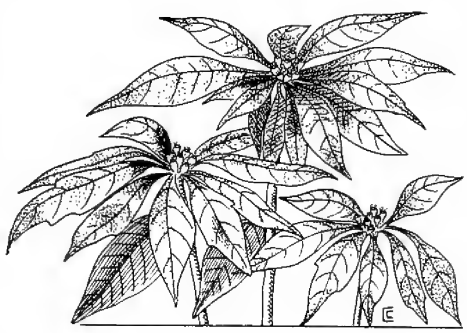
If our vision would permit, we could see that water molecules have begun to diffuse from the soil into the seed, pushing apart the molecules of the seed

coat. We call this imbition, and it is the same phenomenon that causes boards to warp or doors to swell in damp weather. Water molecules pass on through the seed coat and enter the cells of the embryo — we call this process osmosis. Water entering the cells increases the water content or degree of hydration of the protoplasm, and respiration increases. Because the molecules of water have forced the molecules of the seed coat apart oxygen may enter more readily, contributing to an acceleration of respiration. The seed we say has now "come alive," but remember it was not dead. Respiration, the process most indicative of life and one which occurs in all living cells, is now occurring more rapidly, and signs of life are simply easier to detect. We have said respiration is the oxidation of food. Where, then, does the food used by this developing embryo come from? There is some in the seed—in the fleshy cotyledons of the embryo or in the endosperm surrounding the embryo, depending on the kind of seed we planted. In a corn grain, for example, starch accumulates in endosperm tissue. Digestion of starch can occur much as it does in our own mouths, and sugar is formed. This can not last for long because the seed was so small—certainly there was not enough food to last the plant all its life. But there is another source some people say—the soil—for when we prepared the seed bed we added fertilizer or "plant food." Let's take a closer look at what we added.

That bag of fertilizer was mostly inert material, maybe sand, to make a lot of bulk so we could spread the essential materials more uniformly. Are these essential materials really food? Let's examine them. We find many are the kind of chemical compounds the chemists call soluble salts; compounds containing the elements nitrogen, phosphorus, potassium, and others. Aren't these foods? When you reach for the salt shaker at the dinner table and sprinkle the steak or potatoes liberally, you would not say that you were adding food. Yet at least one of the elements in table salt is essential for the proper development of your body. If not foods, what then shall we call them? Why not the same as we call the substance in the salt shaker—salt? For example, a fertilizer material such as sodium nitrate can be correctly referred to as a nitrate salt.

Chemically these materials we add to the soil are not like the substance in the endosperm that is the initial source of food used by the developing embryo. We mentioned that there is starch in the endosperm that can be digested to sugar. Recall the potatoes on the dinner plate—we all know that potatoes contain a large amount of starch. When we eat the potatoes, starch is digested to sugar, and this can be oxidized in our bodies during respiration the same as in the young plant. There seems to be a basic similarity here between plants and man. Could it be that the things we call food for ourselves are also the foods used by plants? Yes, that is the case. The foods used by both plants and animals belong to the classes of compounds that are called carbohydrates, fats, and proteins. We all recognize that these substances are neither added to the soil, nor found floating in the air, nor present in the irrigation water. We sit down to three square meals a day to get our foods, and we eat plants or parts of animals which have eaten plants, but plants can not do this. If we do not add food to the soil in which the plant is growing, how then can it obtain the food essential to growth? The best explanation is that food is synthesized within the plant itself. How is this accomplished? Let's come back to this point in a moment, but first let's see what is happening to the plant before the source of accumulated food is depleted.

The seed germinated and, as the root emerged from the seed coat, it grew downward into the soil, and the stem started to grow in an upward direction. Why did the root grow down and the stem grow up? Certainly the plant did not know which way was up. Maybe some person, while facing the east in the full of the moon, planted the seed right side up. What would have happened if the seed had just been thrown into the ground any old way? The same thing—the root would grow down, and the stem would grow up. Why? Carefully conducted experiments have demonstrated that the direction of growth of roots and stems is controlled by the distribution of hormones known as auxins. If a plant is placed on its side, the roots will grow downward, and the stem will curve upward. Under the influence of gravity auxins accumulate on the lower side of the root and stem where they affect the rate of cell elongation. The concentration of these materials that promote growth is higher in the stem than in the root. Therefore, when auxins accumulate on the lower side of a root, they inhibit elongation of that side; the upper side of the root elongates more rapidly than the lower side. The uneven rate of growth in length of the two sides of the root causes the root to grow downward. After the root is oriented in a vertical direction, the distribution of auxins becomes uniform, and growth continues in a downward direction. The accumulation of auxins on the lower side of the stem has a promoting effect, and the stem curves upward. As growth continues, the roots penetrate deeper into the soil as the shoot emerges from the soil and heads skyward. By now the food reserves are nearly exhausted, but the plant will not starve because series of events are happening which make it possible for the plant to synthesize its own food. As the shoot emerged from the soil it became exposed to light, and the leaves and shoot became green as chlorophyll developed in some of the cells.



The process of making sugar that is known as photosynthesis can now occur. Carbon dioxide of the atmosphere enters the plant and finally gets into the cells containing chlorophyll. Water has entered the plant from the soil by way of the roots. Chlorophyll absorbs the light energy and in some way activates photosynthesis in which carbon dioxide and water combine, resulting in the formation of sugar containing chemically bound energy. Sugar can be oxidized in respiration and is also the initial material used in the synthesis of other foods. Fats can be synthesized from sugar in any living cell. You are all aware that this can also occur in your own bodies. When you go on a reducing diet, one of the first things

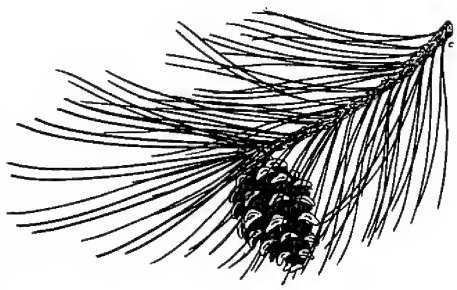
you omit from your daily menu is large amounts of carbohydrate. At this point one might ask, "Why add the minerals? I can't see where they are being used."

The mineral elements have many roles. For example, they are important constituents of the other class of foods, proteins. In the synthesis of proteins, which can occur in any living plant cell, sugar and nitrate, phosphate, and sulphate salts are utilized. Nitrogen and magnesium are constituents of chlorophyll which is essential to photosynthesis. Calcium salts of pectic acid are formed in the cell walls. Some of the mineral elements act as catalysts. Others have an effect upon permeability of cell membranes; other important roles might be enumerated. These elements are essential to the proper development of plants, and it is a necessary cultural practice to add them to the culture medium when adequate amounts are not available, but we still would not be correct in calling them foods.

The shoot of the plant appears to be able to synthesize its own food, but what about the roots? We have said that fat and protein synthesis can occur in every living cell of the plant; therefore these processes can occur in the roots. But where will the sugar come from that is the initial material utilized in both of these processes? The roots are underground, not exposed to light, nor do they contain chlorophyll; certainly photosynthesis cannot take place in them. This problem focuses our attention on a transport system that occurs within the plant. Sugar synthesized in the aerial portion of the plant is soluble and can pass from cell to cell. When sugar passes into the phloem of the stem, it can be translocated to the underground portions of the plant. The phloem is one of the tissues located in the outer part of a stem which you recognize as the bark on a woody stem.

The roots, then, are dependent upon the shoot for a source of sugar. If the tops of plants are kept removed, the roots will die of starvation. It is also interesting to note that a disease of elms, known as phloem necrosis, is associated with death of the phloem which prevents the movement of sugar to the roots; unable to synthesize sugar, they die of starvation. After death the roots decay, and water can no longer enter the plants at a rate which keeps pace with the evaporation of water from the leaves. The evaporation of water from the leaves—a process called transpiration—results in the loss of large amounts of water by plants. If the absorption of water by the roots of a plant does not occur so rapidly as transpiration, the plant wilts; and if transpiration exceeds absorption for an extended period, the plant will dry up and die, or we say the cause of death is desiccation. Since water is being lost so rapidly to the atmosphere by plants, it is necessary in our cultural practices that we continually add water to the soil—if nature does not provide enough to make up for these transpirational losses.

Why does transpiration occur if it often proves detrimental to plants and may result in their death? It occurs in the same way that water evaporates from an open pan. Water, like all substances, is made up of molecules which are constantly in motion, and they continually escape from the surface of the water and enter the atmosphere. There are also water molecules in the air, and the path of motion of some of these could land them in the pan. But since there is a greater concentration of water molecules in the dish than in the air, more water molecules will escape from the dish than enter it in any interval of time. So we see that whenever there is a greater concentration of a certain kind of molecule in one region than in another, the net movement of molecules will be toward the region of lower concentration of that kind of molecule. We then say that diffusion is occurring. Since these principles apply to all molecules, we know that they will diffuse from place to place irrespective of whether or not it will be beneficial to the plant. The diffusion of carbon dioxide into the plant may result in the continuance of photosynthesis which would be beneficial; but since the same physical laws govern the movement of water molecules, they will diffuse from the plant even though this may result in wilting.



We must be careful therefore, when we add mineral salts to the soil. Since they are soluble, they will dissolve in the water in the soil and reduce the concentration of water molecules surrounding the roots of the plants. If the concentration of water molecules in the soil is reduced, the rate of entrance of water into the roots will decrease; and a condition may result in which transpiration will be in excess of the absorption of water. Many of you have probably seen situations in which large amounts of fertilizer were applied to the soil and have heard the expression that the plants were "burned up." A more accurate explanation of what happened was that transpiration exceeded absorption, a water deficit caused the plant to wilt and dry up, and death from desiccation followed.

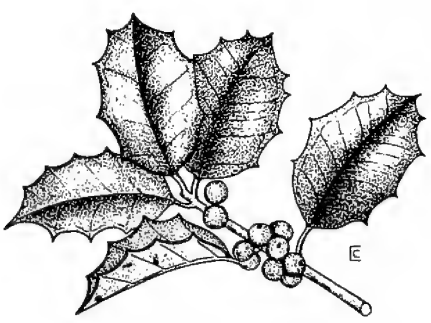
We can now readily understand that if conditions are maintained so that the plant is supplied with sufficient light intensity and a favorable amount of certain inorganic materials, the various processes will occur at rates which will result in satisfactory growth of the plant. Because of its effect upon numerous processes within the plant, temperature cannot be ignored and must be maintained within a favorable range. We can now visualize the activity going on within or around a plant. Water is entering the roots and moving upward through the xylem, the tissue that you call the wood in a tree, into the leaves and out into the atmosphere. All along the way some water is used in various processes going on in the cells. Carbon dioxide molecules diffuse into the plant and are utilized in photosynthesis. Sugar is synthesized. Some of it then passes from cell to cell, and some of it enters the phloem and moves downward into the roots. The sugar is then utilized in all the living cells in the synthesis of other foods. Some sugar is also oxidized, resulting in the release of energy, and still other sugar molecules are used in the synthesis of the substances of which the cells are composed.

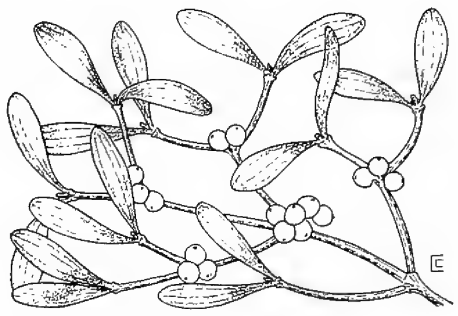
Oxygen enters the plant and is utilized in the oxidation of foods in the process of respiration. As more sugar is synthesized and moves downward into the roots, and as additional minerals enter the roots and move upward through the plant, the synthesis of ad-

ditional food occurs. As more food becomes available, more substances of which cells are composed can be synthesized, and continued growth and development of the plant occur. In order to conserve the amount of available sugar and direct its movement into one or two particular shoots, disbudding is often practiced. Here the lateral buds are removed so that large amounts of sugar will not be used in the development of shoots that will not contribute to the overall beauty of the plant, thus making more sugar available to the remainder of the plant. We see now that all parts of the plant are closely interrelated and considerable mutual dependence occurs between the various plant organs. A further illustration of this interdependence is the substance thiamine that is synthesized in the leaves and moves downward to the roots where it is essential to growth. In the plant this is a hormone, but you have probably purchased it at a drug counter under the name Vitamin B_1.

Here is another basic similarity between plants and man. The same substance which we call a vitamin and which is essential to us, is also essential to the growth of certain plant parts. As we learn more about what goes on in plants, we find that substances which we have classified as vitamins may have very similar roles to those substances we call hormones. Perhaps we should not try too hard to place these substances in separate pigeonholes but should develop a broader concept of these organic substances which, although they are not foods, are essential to the proper development of living organisms.

As the shoot elongates, we notice that branches are not developing from lateral buds near the lower part of the stem, but for the most part are occurring from buds in the upper portion. When the terminal bud is removed, branches develop from the lateral buds. This inhibiting influence of the terminal



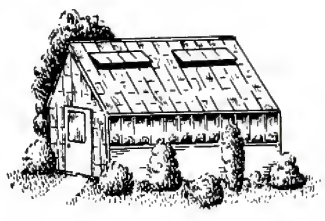


bud over the lateral buds is known as apical dominance and is caused by hormonal relationships. A common practice is to remove the terminal bud, or "pinch" the plant, thus eliminating the inhibiting effect of the terminal bud. This causes the development of branches from lateral buds and results in a plant of the desired form.

As growth continues, a large healthy-looking plant develops. It has taken a lot of time and energy to maintain the environmental conditions within a range that permits the embryo within the seed to develop into a mature plant. The plant looks fine, but there is one important thing missing. There are no flowers. Perhaps you have read about photoperiodism or learned through actual practice that the formation and development of flowers is controlled by the length of the light period to which the plants are exposed. If this was a chrysanthemum plant, we know that flowers would not develop unless the days were shorter than some critical length, and so we would begin each day to exclude light from the plants for the greater part of each twenty-four-hour period. We know that temperature within the dark period also has an effect upon the development of flowers in some plants, and so careful control of the temperature of the greenhouse within a certain range during the period of darkness is important.

Why should a change in the length of the day cause the development of flowers? We do not have all the answers yet, but the results of critical experiments permit us to draw a few inferences about what is going on. We know that the environment around a plant affects the development of a plant by first affecting some process which goes on inside the plant and upon which the observed behavior of the plant is dependent. In this case the observed phenomenon is flowering. What process inside the plant then is being affected which in turn causes the development of flowers? We find that if certain plants are exposed to a given photoperiod, they do not flower; but if exposed to some other photoperiod, flowering will occur. The question then arises, how much of the plant must be exposed to the favorable photoperiod before flowering will occur? In some plants only a small part of a single leaf need be exposed to the favorable photoperiod to cause flowering. Even more spectacular is the fact that in a certain species a single favorable photoperiod is sufficient to cause the development of flowers, even though the plants are thereafter exposed to day lengths in which they would ordinarily not flower. Another almost unbelievable happening is that if the dark period is interrupted with a flash of light of very low light intensity—about that from an ordinary flashlight—flowering is prevented, even though the total amount of light to which the plant is exposed is within the range which should cause flowering. Indeed, certain greenhouse operators have reported that the light from the headlamps of passing automobiles has in some instances prevented flowering. What is happening within the plant that light could have such a profound effect? The actual sequence of events is not known at the present time. It is postulated that a substance(s) is synthesized in the blades of the leaves and moves to the stem tip where it causes the development of flower parts. The substance must be present in very small quantities, and therefore it is inferred that it is a hormone; in fact it has been called the flowering hormone and some have given it the name "florigen." None of this substance has as yet been isolated from plants so its exact nature cannot be stated.

We have followed a number of events that occurred in the life of the plant that developed from the hypothetical seed we planted a few pages earlier. The plant has now flowered, and subsequently pollination and fertilization will occur, resulting in the formation of fruits and seeds. Thus the life cycle of our mythical plant is completed.



TAXONOMY, AN UNFAMILIAR NAME FOR A FAMILIAR GARDEN ACTIVITY

By **Caroline K. Allen**

Dr. Allen is Visiting Research Associate at The New York Botanical Garden.

TAXONOMY IS THE classification and identification of plants. It is as simple as that. Much time and effort go into taxonomy at The New York Botanical Garden. To show its importance and its close relationship to other garden activities, I must give a bit of background and describe a few of the methods used in this study.

A number of cities have an arboretum or botanical garden which has grown with the years and become a part of their way of life. As St. Louisans delight in The Missouri Botanical (Shaw's) Garden and Bostonians in the Arnold Arboretum, so do New Yorkers in The New York Botanical Garden.

Two kinds of work go forward in these institutions: the first, and more obvious, results in the landscaped gardens and other areas filled with the beauty of growing things; the second, less obvious but equally important, comprises scientific research.

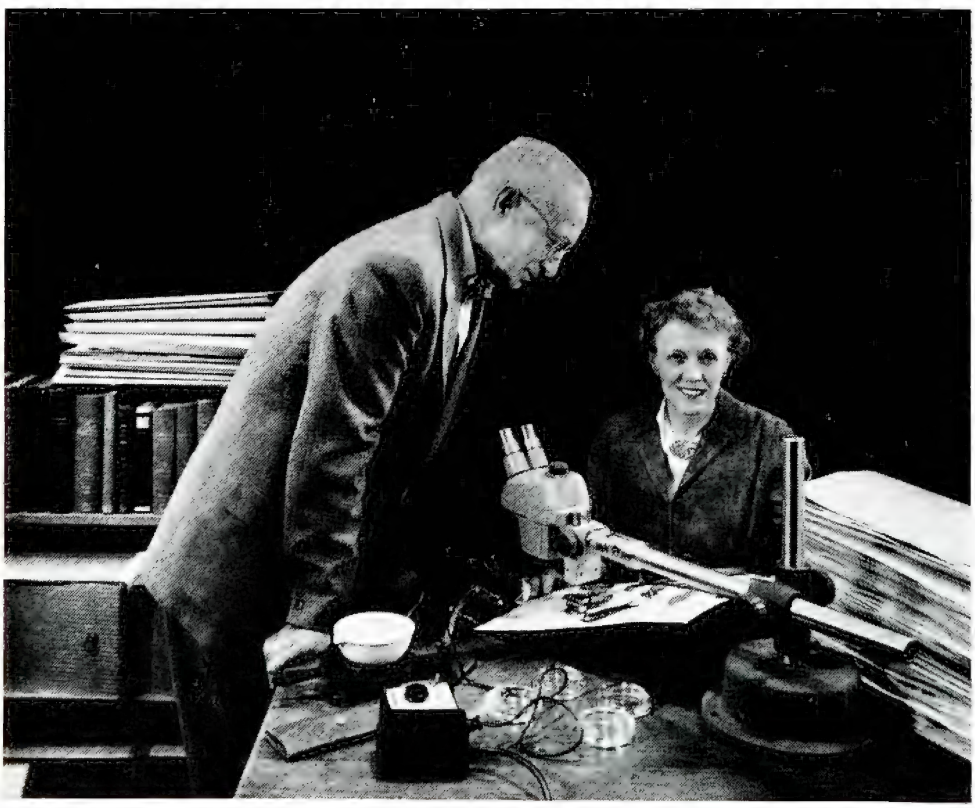
The first comes under the general head of horticulture, well known to all visitors from the amateur plant grower to the professional horticulturist. They enjoy the ever-changing garden and greenhouse displays, which are outward manifestations of the superb cultural techniques practiced in the propagating range under the direction of Louis Politi, Horticulturist. From time to time they have glimpses of this basic work in the pages of *The Garden Journal.* Very often these are illustrated by photographs taken by E. N. Mitchell, Staff Photographer. Many other plants come to life in these pages through the sure hand of Charles C. Clare, Jr., Staff Artist, who is in great demand for technical illustrations as well. Visitors to the Garden read the books and news articles of T. H. Everett, Assistant Director (Horticulture) and Curator of Education.

Horticulture shares with research in the introduction into cultivation of new plants, which add beauty to the landscape and increase the large number of those already useful in daily living. New plants have been brought into America in several ways. The first settlers raised from seed many herbs from "home," that are now associated with the so-called "colonial garden." Native American plants, some already in use among the Indians, soon became popular abroad. European botanical gardens eagerly sent their own material to our botanical institutions in exchange for these novelties. Many seeds and cuttings from the Old World thus found their way to our gardens.

In our own country, the westward extension of the railroads sparked an interest in exploration which has continued to expand, until today search for plants includes large-scale collecting in tropical America.

The era of plant exploration initiated in the United States may be roughly divided into three periods. The first began with the naturalists who accompanied fur-trading expeditions into the West and continued with the early governmental and railroad surveys which carried naturalists or botanists commissioned to bring back plant and animal collections, minerals, and other items of scientific interest. The Lewis and Clark Expeditions and the Pacific Railroad, as well as the geological and boundary surveys*, yielded an abundance of new plants. Many a plant discovered on these trips bears a scientific name commemorating the explorer who collected it; *Lewisia* and *Clarkia* come to mind. Dr. John Torrey, acknowledged leader in New World taxonomy, did much in his time to further exploration of the West. In turn, Professors Asa Gray and Charles Sprague Sargent of Harvard continued to promote this activity during the period that ended about 1900.

The second period began at the turn of the century and lasted—again, by an arbitrary division—about twenty-five years. During this interval, the greatest number of plants came from temperate



Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, and the author discuss a new species of *Ocotea* collected by the Maguires on the 1953 Guayana Expedition of The New York Botanical Garden on Serrania Yutajé, Rio Manapiare, Territorio Amazonas, Venezuela.

eastern Asia. Because the climate of this region, exclusive of the tropical and subtropical sections, is comparable to that of the eastern United States, we find in our gardens today many species native to eastern Asia. It is interesting to note that certain groups, although they consist of different species, are common to both areas. The rhododendrons and magnolias are illustrations. Among the prominent collectors of these decades was the late Dr. Ernest H. Wilson, one-time Keeper of the Arnold Arboretum, whose books record plant hunting in the Orient. Another is Dr. Joseph F. Rock, whose fantastic experiences would make excellent reading, could he be persuaded to write about them.

The third and last era, overlapping to some extent the second and spreading into the present time, has been less fruitful as far as producing plants for our gardens is concerned, but far more so from an economic standpoint; for explorations have latterly been pushing into regions other than temperate. In the American tropics, economic interests as well as the purely scientific have been motivating forces, particularly during and after World War II. The United States Department of Agriculture has concentrated especially in this field, and we owe much to its foresight. Among the largest explorations at present are those going forward in northern South America under the auspices of The New York Botanical Garden, with Dr. Bassett Maguire the coordinator and leader. In the economic area, Dr. David J. Rogers, Curator of Economic Botany at the Garden, was actively engaged in the organization of the Society for Economic Botany. *The Journal of Economic Botany*, initiated by Dr. Edmund J. Fulling, Honorary Curator, is now the official organ of the newly founded society and is published by the Garden for the society.

When seeds and cuttings are brought into the country, the usual procedure is to try them out for possible landscape as well as economic use. They are put through many types of tests: soil, temperature, climate, and so on, until the optimum situation for growth and production is determined. Once the new plants are proved satisfactory, they are distributed to cooperating nurserymen throughout the country, who in turn make further tests. Eventually a new plant is introduced to the public through seed catalogues or flower shows, and another exotic blooms in our gardens and greenhouses or appears on the market as a delectable food. This sounds simple and extremely productive. Actually, a large percentage of the newcomers is never seen in cultivation for one reason or another. In spite of these casualties, however, vast numbers of plants have been introduced into the United States. This does not necessarily mean that they may not have been cultivated in the region in which our collectors found them, in some bygone or recent era. In fact, it is rather generally believed that the plants from eastern Asia that flourish so satisfactorily in our climate were brought into cultivation in their native lands, perhaps centuries ago.

Among the more than four thousand Arnold Arboretum introductions into cultivation during the past eighty-five years are the graceful beauty-bush *(Kolkwitzia amabilis)*, the striking Chinese variety of the Japanese dogwood *(Cornus kousa chinensis)*, the colorful Korean and torch azaleas *(Rhododendron yedoense poukhanense* and *R. obtusum kaempferi.)*

A second source of cultivated plants is the science of genetics or selective breeding. Botanists are constantly striving to produce hybrids that will be larger than their parents, more hardy, more disease-resistant, and perhaps more economical to grow. The geneticist has improved the quality of food for our tables—apples, corn, avocados, to name a few—and has enriched our gardens. The forsythia hybrid *(Forsythia spectabilis)* with spectacularly large blooms came into being by chance a few decades ago at the Arnold Arboretum during breeding experiments. We owe, too, the long-blooming flowering cher-

Dr. Annette Hervey, Research Associate, in the Research Laboratory of The New York Botanical Garden.

ries and ornamental crabs to the precision and expert methods of the geneticist. The results of the late Dr. A. B. Stout's hybridization of daylilies (*Hemerocallis*) are seen in many gardens.

An important research that of necessity keeps abreast of horticulture is plant pathology, the study of plant diseases, their prevention and their control; a science of inestimable value for landscape beauty as well as economy. Dr. P. P. Pirone, Plant Pathologist at The New York Botanical Garden, who has written several books on the subject, is constantly consulted by gardeners interested in growing healthy plants.

Research is going forward continually under the supervision of Dr. Richard M. Klein, Alfred H. Caspary Curator, in the plant physiology laboratory completed within recent years. The program initiated by Dr. William J. Robbins twenty-five years ago paved the way for current work with antibiotics and vitamins.

So much for the work of botanical gardens that has eye-appeal, horticulture, and that has an obvious practical application, physiology and pathology. Now to the less conspicuous but highly important research of taxonomy. The history of taxonomy, and its development, is an absorbing story in itself, and one that deserves to be and I hope will be presented at a future date. Early man showed great interest in and curiosity about his surroundings. Enter-

* Lewis & Clark's Travels to the source of the Missouri River and across the American continent to the Pacific Ocean, 1804-1806.

United States: **Bureau of Topographical Engineers**
Report of exploring expedition from Santa Fe, New Mexico, to the junction of the Grand and Green Rivers of the great Colorado of the West in 1859, under the command of J. N. Macomb.

Secretary of the Interior
Report on the United States and Mexican Boundary Survey, 1859.

War Department
Reports of explorations and surveys, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean, 1853-(6).

And many others.

Dr. David J. Rogers (left), Curator of Economic Botany, compares roots of varieties of tapioca *(Manihot esculenta)* in the field in Jamaica during a recent collecting trip.

prising individuals among the ancients who practiced the art of healing with herbs undoubtedly, by word of mouth, passed down names for the plants they used. The era of herbals contributed its share towards classification. It has been said that taxonomy, as we understand it today, began with the system of classification presented by the Swedish botanist Linnaeus.

Two branches of taxonomy are open to the student, and it is his individual temperament that prompts his choice. Broadly speaking, if he is the type of person who wants to know a little about a lot of different things, he will choose what is known as floristic work. He may take his own home, let's say Scarsdale, New York, and work intensively to discover and record every plant native to that township. His published work will be a Flora of Scarsdale. Or if he is ambitious, he may cover the entire county and produce a Flora of Westchester County; or even —though this would usually be far beyond the experience and capacity of the tyro—a Flora of New York State. Good regional floras, for which The New York Botanical Garden is celebrated, are extremely valuable. Through the years many have appeared under the authorship of staff members: *An Illustrated Flora of the Northern United States, Canada and the British Possessions,* by Nathaniel Lord Britton and Addison Brown; *Flora of the Southeastern United States,* by John Kunkel Small; *Flora of the Rocky Mountains and Adjacent Plains,* by Per Axel Rydberg, all of which have been revised and edited at least once. The tradition has been continued in recent times with Dr. David D. Keck's (Head Curator, 1950-58) collaboration on the *Flora of California.* Dr. Arthur Cronquist, Curator, wrote Volume V (1955) and the major portion of Volume IV (1959) of *Vascular Plants of the Pacific Northwest,* a much-needed contribution. *The Botany of the Guayana Highlands* by Dr. Bassett Maguire and collaborators is appearing serially.

On the other hand, if the taxonomist is less prone to spread his energies, he will select a single group of plants (a genus or a family), perhaps the gentians or saxifrages of the world. He will study this group of plants exhaustively to learn as much as possible about their characteristics and their relationship to other groups. He will determine how many different species occur and how they differ. Before he describes and names a plant that he believes to be new, he must be very sure that it is not merely an extreme variation of a known plant caused by an extreme environment. We may recall the strikingly different appearance of a common weed, cropped by animals in pasture, or cut by the lawn mower, as opposed to the aspect of the same kind of weed growing undisturbed, protected perhaps by a fence or a wall.

The study of taxonomy is carried on for the most part with the aid of a good botanical library and herbarium, both of which are found at botanical institutions throughout the world. The New York Botanical Garden offers excellent facilities of this type for the student, particularly one interested in research on American plants. The Library of over sixty-four thousand bound volumes, not to mention some three hundred and fifty thousand pamphlets, is under the care of James Daly, Administrative Librarian. Miss Elizabeth C. Hall, Sarah Gildersleeve Fife Research Librarian, whose general public knows her as "Miss Information," aids professional botanists also in many important ways.

In close connection with the Library is the work of the Bibliographer and Acting Assistant Director (Botany), Dr. Harold William Rickett, who is Editor of the *Memoirs,* the organ that carries the research of the staff. The Garden also publishes *Brittonia,* organ of The American Society of Plant Taxonomists. Dr. Rickett is closely associated with the International Association for Plant Taxonomy (headquarters in The Netherlands), which symbolizes world-wide importance of taxonomy.

The second requisite for the study of taxonomy offered by the Garden is the Herbarium (a collection of dried plants arranged systematically by families and used for reference) of approximately 2,790,000 specimens under the supervision of Dr. Bassett Maguire, Head Curator.

An herbarium built up by careful selection is an invaluable reservoir of information. The scope of any herbarium is essentially a reflection of its personnel and their various interests. At New York, Dr. Britton's concern with West Indian plants led to a large collection from that area; Dr. Small added material from the southeastern United States and Dr. Rydberg from the Rocky Mountains and Great Plains. When China was opened to the West, Dr. E. H. Wilson, pioneer collector, laid the foundation for eastern Asiatic

collections which, augmented through succeeding years, made Harvard's Arnold Arboretum one of the leading institutions in Oriental botany. Specialists in various plant families are frequently responsible for large numbers of their particular groups. Dr. H. A. Gleason, specialist on Melastomes, accumulated thousands of sheets of *Melastomataceae* at The New York Botanical Garden; as a result of the zeal of MacKenzie, a student of *Carex,* the Garden offers abundant material for research on this genus. And so on.

An herbarium may be accumulated in three major ways other than by special collections: by subsidy, purchase, or exchange. An institution may send out an expedition in search of plants or may contribute jointly with other institutions towards a project for collecting in a given area. A particular collection may sometimes be purchased outright from an institution sponsoring an expedition, or from a professional collector. Often young botanists will finance a summer in the field by collecting plants from a little-explored area and selling sets to botanical centers. The experience of identifying his summer's collection, as well as the actual field work, is good training for the student.

A third way of building up an herbarium—and this is often the most important — is by exchange with other institutions. A set of the Maguire Venezuelan material at The New York Botanical Garden may be offered in exchange for a set of Panamanian plants from The Missouri Botanical Garden. The Royal Botanic Gardens at Kew may send a duplicate set of Thailand plants to Harvard in exchange for a set of the Archbold New Guinea collection. Needless to say, keeping records of the exchange balance involves a considerable amount of detail. At The New York Botanical Garden all incoming and outgoing specimens—exchanges, purchases, gifts, and loans—pass through the hands of the Custodian, Frank C. MacKeever.

Small collections, usually from amateur botanists, are received as gifts. Many come in at random from interested individuals for identification. I should like to urge anyone sending plants for identification to choose a specimen adequate for study. An adequate specimen is: a twig or branchlet which has either flowers or fruit, preferably both, *attached;* and leaves, *attached.* Before the branchlet (which should be 6-8-10 inches long, depending on how much is necessary to show attachment of leaves, flowers, and/or fruit) is sent, it should be pressed until dry between sheets of newspaper under a heavy weight. A book or a stone will keep an even pressure. For professional collecting, or for a permanent herbarium, the technique is more complicated, but for the purpose of identification, this will do. The size of the plant, shrub, or tree should be stated, if known, and the color of flower, fruit, and leaves. The date of collection and geographical location are essential. It is helpful also—and cuts down the time and effort of the taxonomist—if the sender states whether he found the plant growing in a garden or wild; in the sun or shade; in a moist, damp patch of ground or on a dry, rocky hillside—environment again. By furnishing this information, the sender will be sure of a more prompt and more accurate determination, to say nothing of the gratitude of the often unknown taxonomist who is trying to help him. Even at best, identification may often be difficult, as E. J. Alexander, Associate Curator, can testify. Mr. Alexander is the "botanical Sherlock Holmes" who does a large part of the identification for the Garden's public. As is very evident, the taxonomist spends much of his time in routine herbarium work.

For his research he must have access to a large, well-organized herbarium, with the privilege of borrowing supplementary material for study from other institutions if necessary; he needs as well the facilities of a good botanical library, both already mentioned. An adequate hand lens is essential for studying the outward characteristics of plants, such as hairiness. For a more minute examination of floral parts a compound microscope should be available and a set of dissecting tools to prepare those parts for study.

The personal equipment of the taxonomist must include a thorough knowledge of Latin, the universal language of botany since medieval times—the botanical "esperanto," one might say. According to the International Rules of Botanical Nomenclature, an original description of a new-found plant must be published in Latin in order that its name be valid. A reading knowledge of French and German is necessary, since a large portion of taxonomic work was done in Europe in

In this group of orchids in the Propagating Range of The New York Botanical Garden are plants brought back by Lincoln Adderly from the Garden's 1958-59 expedition to northern South America. These include species of *Catesetum* (right) not yet identified and *Galeandra devoniana* and *G. lacustris* (left).

the nineteenth century. Today the student of Latin-American plants needs to add Spanish and Portuguese to his linguistic accomplishments.

A study of ecology, which I mentioned as the relation of a plant to its environment, gives the taxonomist a better understanding of variation in plant structures. An acquaintance with the principles of allied sciences is important: geology for its basic contribution toward plant distribution; paleobotany for its phylogenetic implications. Each of these plays its part in promoting a fuller understanding of plants in general and enables the taxonomist to cope more adequately with his research problems.

The study of plant anatomy is an aid to taxonomy when used in conjunction with it. The taxonomist studies the easily seen characteristics of leaf, stem, flower, and fruit. The anatomist, a botanical John Gunther, gets "inside" and studies their internal structure—the vascular system which conducts fluids in plants. Many students frequently use both these phases of plant science to corroborate their findings.

A study of pollens (palynology) and cellular structure (cytology) will often give the taxonomist a clue to the identity of a plant and its relationships.

Has taxonomy any practical value? Why should its study be important to our way of life?

It is obvious that it is of value in providing correct names for use in horticulture and plant breeding; in pathology, for often the infecting organism is specific for a given plant; and in forestry, particularly for timber trees growing in newly developed regions and as yet untapped for commercial use. The search for oil in modern times has been aided considerably by the identification of pollen found in the substratum in various areas. The presence of the pollen of certain key species is known to be an indicator of the presence of petroleum oil.

In connection with geology, a need for taxonomy of a different type has arisen as the result of an increasing interest in paleobotany. The Garden's collection of fossil plants is currently being reorganized and new flora added by Dr. Herman Becker, Visiting Research Associate.

The problem of allergies has been brought to public attention during the past decades, and many of the treatments depend on the correct identification of plants used for the purpose. The current interest in antibiotics has pointed up the need for accurate naming of the plants so involved. The isolation of reserpine, a tranquilizer-antihypertensive alkaloid, from *Rauwolfia serpentina* instigated a taxonomic revision of the genus *Rauwolfia* by Joseph Monachino of The New York Botanical Garden staff. Mr. Monachino also gave a much-needed name to the *Strophanthus* variety that yields a high percentage of sarmentogenin, that extremely valuable compound suited for conversion to cortisone. The taxonomy of *Ryania,* source of an insecticide, was clarified also by this same botanist.

In addition to the important taxonomic research on the flowering plants, mention should be made of the significant studies that go on under the supervision of Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium that houses those plants that produce neither flowers nor seeds—the mosses, algae, fungi, and so on. The medical and economic application of studies of the latter are well known. The late Dr. B. O. Dodge, in his classical studies of *Neurospora,* laid the foundation for experiments in genetics during the decades that have followed. Only a few strains of one of the many species of the fungus *Penicillium* yield the important drug penicillin. The part of the taxonomist is obvious in this instance.

A few years ago, an adulterant discovered in cigarette tobacco was identified at the request of the Pure Food and Drug Commission, thus preventing a wholesale poisoning of smokers. A New England farmer's pure-bred cattle were dying from an unknown poison, presumably from a pasture weed. The botanist discovered the poison-hemlock (*Conium maculatum*) to be the culprit. This type of identification has become standard procedure for the taxonomist through the years.

In the preparation of condiments, accurate determination is especially important. Under the general trade name of "oregano" there may be a single variety or a combination of any of the forty-four different varieties of the species involved, each adding its special flavor for a specific use. A knowledge of the plant that supplies each is obviously necessary. The same is true of curry. No two curry powders are ever alike in composition, for all are mixtures, each to be used in a special dish. One may elevate the lowly egg to a concoction for the gourmet's delight; another may enhance the flavor of an otherwise mediocre veal casserole.

Many immediate problems arising in daily life have been solved by the taxonomist. The State of Massachusetts was planning a new game preserve and wished to establish deer from Alaska within its acres. What food would the deer require in order to thrive in their new habitat? Because deer are ruminants, this presented no difficulty. A couple of dozen were killed, and the contents of their stomachs sent to the taxonomist for identification. Among other plants, twigs of the northern willow were still recognizable.

A few years ago, attention was focused on an old will which had been disputed between two heirs in Canadian

(Continued on page 217)

Students of a class in field botany collect specimens for identification and mounting.

Heavily fruited specimen of *Pyracantha* 'Graberi'.

The Cultivated Pyracanthas

By

Francis de Vos

Dr. de Vos is Assistant Director of the National Arboretum, Washington, D. C.

FIRETHORNS ARE by far the most colorful shrubs in the autumn landscape of the southeastern states. Briefly challenged by the autumnal foliage of a myriad of deciduous shrubs and trees, they outlast their competitors and remain the cheeriest plants in the drab landscape of early winter. No garden in areas where they can be grown should be without at least one specimen of the firethorns.

The genus *Pyracantha* to which they belong is closely related to such genera as *Cotoneaster, Crataegus,* and *Mespilus,* and has been assigned at different times to one or the other of these genera. The genus is also closely related to *Osteomeles,* with which it has been hybridized to produce the monotypic bigeneric or hybrid genus *Pyracomeles* and the hybrid species *P. vilmorini* (*Pyracantha crenato-serrata* x *Osteomeles subrotunda*). The genus *Pyracantha* can be readily distinguished from these closely related genera, but it is difficult to distinguish between the different species and cultivars of *Pyracantha.*

Let us take a closer look at the six species of *Pyracantha* that are in cultivation in this country to see how they differ.

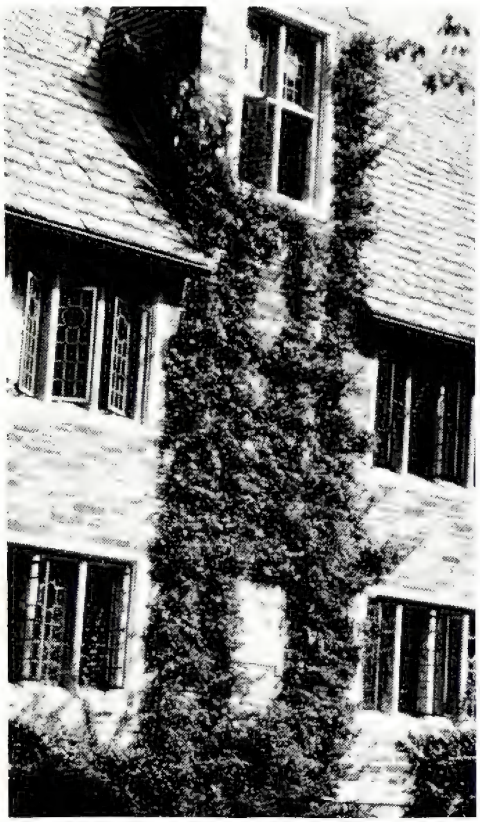
Pyracantha augustifolia is native to China and is perhaps the most tender of the species. The tomentose condition of the under surface of its leaves and of its calyces clearly set this species apart from the others, which are essentially glabrous. Typically a broad-spreading shrub which reaches a height of ten to twelve feet, it does on occasion produce some prostrate branches. Its fruits are orange-yellow and flattened on the ends.

Pyracantha atalantioides, also native to China, makes a very strong upright-growing shrub fifteen to twenty feet in height. This species is frequently referred to as the Gibbs firethorn (*P. gibbsii*), because it was named after the Hon. Vicary Gibbs in whose garden in England there was a magnificent specimen. Later nomenclatural studies, however, revealed that *P. atalantioides* was the first name given to this species and should take precedence over *P. gibbsii.* The most distinguishing features of this species are its leaves which are larger than those of other species, ranging up to three inches in length, and the long-lasting quality of its fruits. The bright red fruits are said to stay in good condition until late winter.

Pyracantha crenato-serrata (P. yunnanensis) is closely related to *P. atalantioides* and can best be distinguished from it by its leaves. These are widest above the middle, toothed, and green beneath, whereas those of *P. atalantioides* are widest at or below the middle, usually without teeth, and slightly glaucous beneath. *P. crenato-serrata* is native to Yunnan Province, China; it was introduced into France in 1906.

Pyracantha crenulata is native to the temperate regions of the Himalayas. Although it is probably more closely allied to *P. coccinea,* from which it differs by its glabrous instead of pubescent corymbs, it may be more frequently confused with *P. crenato-serrata.* It differs from the latter in that its leaves

Pyracantha 'Rosedale' trained as a standard.



Espaliered plant of
Pyracantha coccinea lalandii.

are less rounded at the apex. The fruits of this species range from orange-red in the typical variety to yellow in the variety *(P. crenulata) flava.*

Pyracantha coccinea, especially the hardy upright form *P. coccinea lalandii,* is the most widely grown of the species. It is native to southern Europe and Asia Minor and makes a typically broad-spreading shrub up to about twenty feet in height. It can be distinguished from *P. angustifolia* in that its leaves are only slightly pubescent beneath. The fruits of the species are bright red and those of the more popular *P. coccinea lalandii* are orange-red.

Pyracantha koidzumi (formerly *P. formosana* and sometimes still listed as such) is the most widely grown species in the southeastern states. This Formosan species is only precariously hardy in Washington, D. C., and is not usually found in northern gardens. Its bright-red fruits are borne in great profusion and last until early spring if left unmolested by birds. It can be distinguished from *P. crenato-serrata* by the lack of teeth on its leaves and from *P. atalantioides* by its smaller leaves, which are green beneath.

Although the species seem to be reasonably distinct, it is difficult and frequently impossible to determine the true identity of specimens growing in our gardens, that is, to which species to assign them. There are four reasons for this: (1) the true species are rarely grown; (2) plants raised from seeds of open-pollinated flowers are variable in foliage and habit, and seeds from red-fruited varieties often give rise to yellow- or orange-fruited forms; (3) since the chromosome number is probably the same for all species, seeds collected from plants growing in collections containing more than one species are likely to give rise to interspecific hybrids which are intermediate to both parents in many of their characteristics; (4) the color and size of fruits can differ markedly under various cultural and light conditions.

The biggest obstacle to the successful culture of the firethorns was removed with the advent of can culture. The firethorns had a notoriously bad reputation, and justly so, for being difficult to transplant and establish. This problem has virtually disappeared since can culture and the technique of growing them in wire baskets have become standard nursery practice.

For maximum flowering and berry production, full sun is required. However, in areas where a particular variety is known to be on the border line of hardiness, a compromise site in which there is full sun part of the day and some winter shade will minimize winter burn of the foliage. Careful observations on the changing patterns of shadows around the grounds may reveal suitable sites.

The firethorns will grow in a wide range of soil types and acidity as long as the soil is well drained. They will not tolerate "wet feet."

Some pruning is usually required to develop reasonably compact plants. The four-to-five foot long shoots that frequently develop after the second year should be headed back by half their length just before growth in the

Fruiting clusters (left to right) of *Pyracantha* 'Graberi', *P. koidzumi splendens,* and pyracanthas 'Pride of Rochester', 'Rosedale', and 'Victory'.

spring, or their tips can be cut out when their growth is half complete. It should be kept in mind when pruning that flowering and fruiting occur on short spur-like branches that were formed during the previous growing season. Removal of this growth by pruning or winter-killing of branches with spur growth means the loss of berries for a year.

The most troublesome problem in growing firethorns is the control of insects and diseases. Sudden wilting of new shoots in late spring may be a symptom of bacterial fire blight. The diseased shoots should be cut out, and a spray of the antibiotic streptomycin applied at flowering time. Scab disease may be recognized by the presence of unsightly black scabs on leaves, twigs, and berries. It may be controlled by a spray of ferbam applied when buds break in spring and repeated twice at ten-day intervals. Infestations of the hawthorn lace bug frequently become serious enough by late summer to turn the foliage to an unsightly silvery brownish green color. Three applications of malathion spray at ten-day intervals, starting when the buds begin to swell in the spring, will usually clean up a bad infestation. Infestations of scales may be kept under control by spraying with dormant oil spray in early spring before growth starts.

It is not possible at this time to evaluate fully the different varieties separately for use on a country-wide basis, because test collections have not been established in the various climatic regions across the country. Information is, however, accumulating as individuals and nurserymen try the newer varieties in their particular areas.

FRUIT COLOR AND HARDINESS RANGE OF THE MOST COMMONLY CULTIVATED FIRETHORNS

Name	Fruit Color	Hardiness Zone*
Pyracantha:		
angustifolia	orange-yellow to red	7b
atalantioides	red	6b
(*P. gibbsii*),		
(*P. discolor*)		
'Bakeri'	red	6b
'Belli'	red	8
'Cal Poly'	red	8
coccinea	red	6b
aurea	yellow	6b
'Government Red'	red	6b
'Kasan'	orange-red	5
lalandii	orange-red	5b
'Monrovia'	orange	6
'Sensation'	red	5
'Thornless'	orange	5
'Lindleyana'	orange	6b
pauciflora	orange-red	5
crenato-serrata	red	7b
(*P. yunnanensis*)		
'Graberi'	red	7b
'Rosedale'	red	7b
crenulata	orange-red	6b
'Crimson Tide'	red	6b
flava	yellow	6b
kansuensis	orange-red	6b
rogersiana	reddish orange	6b
aurantiaca	reddish orange	6b
" *flava*	yellow	6b
taliensis	yellow	6b
'Duvali'	red	7b
'Ingleside Crimson'	red	6
koidzumi	orange-red	8
(*P. formosana*)		
'Eddie's Coral'	red	8
'Low Dense'	orange-red	8
'San Jose'	red	8
'Santa Cruz'	red	8
'Santa Cruz' prostrata	red	8
'Stribling'	red	8
'Victory'	red	8
'Walderi'	red	8
'Walderi' prostrata	red	8
'Oxford'	orange to red	7b
'Pride of Portsmouth'	red	7b
'Runyan'	orange-red	5

Approximate Range of Average Annual Minimum Temperature of Each Zone

Zone 1 Below –50° F	Zone 6 –10° to 0°
Zone 2 –50° to –40°	Zone 7 0° to 10°
Zone 3 –40° to –30°	Zone 8 10° to 20°
Zone 4 –30° to –20°	Zone 9 20° to 30°
Zone 5 –20° to –10°	Zone 10 30° to 40°

*The numbers refer to the *Plant Hardiness Zone Map.*

When the suffix b is used with a number, it indicates that the plant is hardy only in the warmer part of a Zone. The map is an adapted version of a color map and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Price, 15 cents. [Misc. Publ. No. 814]

TAXONOMY (from page 214)

courts for years. The land in question was to be divided at that point on the banks of the St. Lawrence River where the salt-water tide stopped. This unsatisfactory division gave one of the heirs about four times more land than the other. It was the pleasant task of the taxonomist consulted to inform the court that at the time the will was drawn up, the tide had come up the river to the exact point that would divide the property in half. Proof? Certain plants that still grew along the banks of the river would never be found there, if the tide had not at some time washed them with salt spray. And so a feud of long standing was settled amicably.

Taxonomy contributes directly to such branches of plant science as ecology. As a by-product of his current geographical and cytological work on arctic mosses, Dr. William C. Steere, Director of The New York Botanical Garden, notes that the moss carpet of this region serves essentially as a differential heat trap. In the summer, the dry moss insulates the soil and in winter allows the heat to escape. For this reason, the ground remains permanently frozen—a condition known as "perma-frost."

These more or less spectacular reports are only incidental in the life of the taxonomist. His major work is, and will continue to be for some time to come, the routine classification, identification, and revision of plant groups important, in the broader sense, in modern living. It is this work that forms a significant part of the Garden's many activities.

Some Outstanding Annuals

By **T. H. Everett**

"Coltness Hybrids" are very pleasing dwarf dahlias.

Mr. Everett is Assistant Director (Horticulture) and Curator of Education of The New York Botanical Garden.

IN EARLY AUGUST I visited the trials of flower garden annuals at the State of New York University, Long Island Agricultural and Technical Institute, at Farmingdale, Long Island. Vaughan's Seed Company cooperated with the Institute in staging these trials.

Rarely have I seen as interesting a collection of annuals in such splendid condition. It occurs to me that the notes I made on the day of my visit may interest readers of *The Garden Journal*.

Almost six hundred varieties, representing about fifty genera, were included in a planting which extended over what must be about two acres. For the most part, they were sown in rows spaced three feet apart.

Of especial interest to me was the section devoted to 1960 All-America trials. Elsewhere in the trial plantings many previous All-America winners were displayed.

Zinnias were so numerous and so good that it was difficult to make a selection. I liked 'Sunny Boy', a cactus-flowered variety, for its strong growth, stout stems, and four-to-five-inch wide, deep yellow flowers. Another cactus-flowered variety, 'Rosalind', with deep rose-pink flowers as large as those of 'Sunny Boy', also showed to good advantage. 'Blaze' with smaller flowers, three to four inches in diameter, is a true cactus-flowered type; its brilliant orange-scarlet blooms are of fine quality.

In the All-America Selections section, an outstanding zinnia was "Gaillardia-flowered Mixed." This newcomer is two feet tall, has good stems and foliage, and flowers that surely bear a strong resemblance to double-flowered gaillardias. This, partly because of the shape of the blooms, which are two and a half to three and a half inches across, and partly because each flower is zoned by having the lower halves of its "petals" deep rose or red in contrast to the pale pink or yellow ground color.

A zinnia labeled 'Semi-dwarf Bright Orange' and one labeled 'California Giant Orange King' promised well. Both have brilliant-colored large blooms; those of the California Giant are almost red and those of the other tangerine-orange.

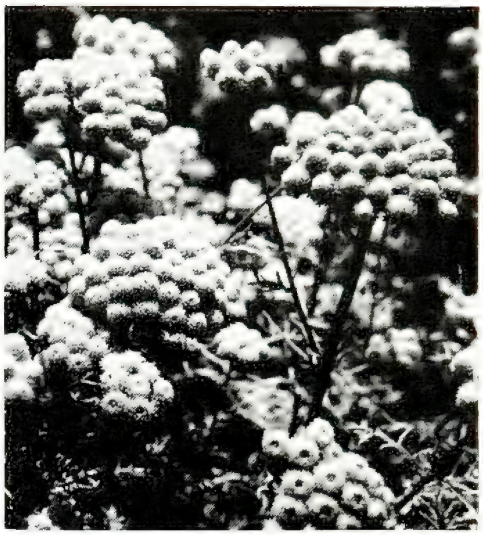
The verbenas were mats of kaleidoscopic color. With the exception of 'Calypso', which incidentally was much taller than any of the others, there was no hint of the muddy hues (even in the mixtures of blends) that were not uncommon years ago. 'Dwarf Crystal' is a pure white of good substance and has exceptionally rich green, firm foliage. 'Dwarf Delight' is similar but has clear medium-pink flowers, each with a white eye. 'Dwarf Dazzler' belongs in the same low-growing group and has flowers of a brilliant red.

Petunia 'Aztec' in the All-America Selections trials is a good newcomer. Very similar to the older variety 'Comanche', it appeared to be a slightly brighter red, but this may be because of a small but conspicuous yellow eye in the center of each bloom which by contrast intensifies the red.

Rudbeckias 'Double Yellow', 'Starlight', and 'Gold Flame' in the order named.

Coleus 'Candidum'.

Snapdragon 'Summer White'.



Lonas inodora 'Goblin'.

Petunia 'Linda' is a pale pink edition of the previous All-America winner 'Coral Satin'. The new variety 'Mercury' is the clearest blue petunia I have ever seen—sky-blue perhaps best describes the color of its single flowers. Both are first class. 'Silver Blue' stood out as one of the best of the bedding varieties. Its single flowers are of a uniform blue somewhat paler than those of 'Mercury'. Of blues verging slightly towards purple, 'Neptune' is good albeit a little lanky for bedding; better, perhaps, for window and porch box planting.

Women visitors to the trials thought highly of petunia 'Sugar Plum'—and so did I for that matter. It has fine substance and withstands stormy weather well. Its single flowers are rather small, upturned, and pink spotted with crimson-violet and with a throat and central "star" of the same plum hue.

A rich purple-leaved sweet basil, which has tiny flowers, attracted my attention in the All-America trials sections. Its leaves have the typical flavor. Planted next to the good single-flowered, clear pink All-America Selections trial petunia 'Linda', it was very effective.

African marigold 'Toreador', an All-America winner, still ranks with the best. Its flowers are clear orange, but apart from coming true to color, they appeared no finer than those produced by a row labeled "Climax Mixed" which included both orange-flowered and yellow-flowered plants.

"Petite Master Blend" of dwarf French marigolds pleased me. The plants were six to eight inches tall and a foot or so in diameter. Each carried an adequate number of well-shaped, double flowers an inch and a half in diameter and varying in color on different plants from clear yellow through orange to deep bronze. The flowers were not so profuse as to hide all the foliage, which is an advantage to my way of thinking.

Near the "Petite Master Blend" were rows of color-selected varieties of this strain. These were:

'Petite Orange', tangerine-orange, 'Petite Harmony', chestnut and orange, 'Petite Gold', golden-yellow, and 'Petite Yellow', clear yellow; all were remarkably true to type.

Celosia plumosa 'Forest Fire Improved' is remarkably uniform with handsome rich purplish red foliage and large plumes of crimson flowers. The plants were two to three feet high. The "Lilliput" varieties of celosia 'Fire Feather', crimson-scarlet, and 'Golden Feather', clear yellow, are not quite uniform, but nevertheless they are good low-growing bedding selections. They are about eighteen inches high and form fine bushy specimens.

Of the cockscomb varieties, celosia 'Toreador' impressed me as being exceptionally good. The plants were eighteen inches high, and each carried a fine large comb of brilliant crimson.

Rudbeckia 'Starlight' is gorgeous.

Celosias 'Toreador', "Lilliput Varieties" and 'Forest Fire Improved' in the order named.

Zinnia "Gaillardia-Flowered Mixed."

Its blooms are mostly semi-double, but this characteristic is not fully fixed and in a small percentage of plants the doubling is not so pronounced. 'Starlight' grows two and a half feet high and has flowers four inches or more across. They are glowing golden-yellow with a purple-brown central cone. This new variety is an improved selection of rudbeckia 'Double Yellow'.

Rudbeckia 'Double Yellow', an All-America winner, is essentially the same as rudbeckia 'Gloriosa Daisy', but the flowers have more petals and are more or less semi-double.

Rudbeckia 'Gloriosa Daisy' has flowers four and a half to five inches in diameter, deep golden-yellow with purplish brown cones. The flowers are informal and a little floppy.

It is interesting to reflect that 'Gloriosa Daisy', 'Double Yellow', and 'Starlight' are successive selections of tetraploids of our native *Rudbeckia hirta,* the black-eyed Susan.

Rudbeckia 'Gold Flame' is excellent. It is fifteen to eighteen inches high and carries masses of single flowers, each three inches or more in diameter. Its purplish cone is prominent. The rays are deep golden-yellow with a chestnut blotch.

Verbena hortensis var.

Of dwarf dahlias, "Coltness Hybrids" (all singles, fifteen to eighteen inches high), "Extra Dwarf Mixed" (semi-doubles, fifteen to eighteen inches high), and "Unwins ××× Hybrids" (semi-doubles, two feet high), are very worthwhile and all exhibited a fine mixed selection of colors.

Coleus 'Velvety Rainbow', with red leaves, and coleus 'Candidum', with yellow and green leaves, are low bushy varieties which I thought especially handsome.

Salvia splendens 'Bonfire' is one of the best red-flowered varieties for beds. The variety 'Rocket' has very heavy spikes of red flowers which do not greatly exceed its foliage and is dwarf and compact. With more graceful and more open spikes, and more of them, salvia 'St. John's Fire' attracted attention as a good red-flowered bedder. Among off-colors 'Violet Flame' is outstanding. Its flowers, abundantly borne, are deep purple-violet. This would make a fine contrast planted near salmon-pink petunias or verbenas.

Phlox drummondii 'Tetra Glamour', an All-America winner, has very large clear pink blooms which deepen in color around the small central white eyes. 'White Beauty' and 'Crimson Beauty' are good compact varieties; their names describe their colors.

Snapdragon 'Summer White' was making a brave show. The plant is of medium height; the flowers, pure white and of good substance, are arranged in close shapely spikes.

Dianthus 'Fire Carpet', an All-America winner, is exceptionally good. Plants grow a foot tall and as much through and are almost hidden by masses of single bright crimson-red flowers.

Prominently labeled "Yellow Ageratum Goblin", a row of an old-time annual excited comment. This "Yellow Ageratum" is *Lonas inodora,* a native of the Mediterranean region and some times called by the inappropriate name of African daisy. Its yellow flowers may be dried as an "everlasting" for use in winter.

Wax begonia 'Red Perfection' makes low mounds and has small slightly bronzed leaves. This is a truly outstanding variety.

Among pink wax begonias, 'Pink Pearl' and 'Thousand Wonder Rose' were notable and, as far as I could see, practically identical.

Very distinct among the *Vinca rosea* varieties was 'Rose Carpet'. This has spreading, prostrate stems and large purple-rose flowers; the petals are darker towards their bases. Individual plants were two feet in diameter and six or seven inches high at the time of my visit to Farmingdale.

FERTILE AND SHOWY HYDRANGEAS

By **Joseph C. McDaniel**

Mr. McDaniel is Assistant Professor in Horticultural Research at the University of Illinois, and President of the Northern Nut Growers Association. From his boyhood, spent in the Tennessee Valley of northern Alabama, he has been interested in native hydrangeas.

Among other woody ornamental plant selections soon to be introduced from the University of Illinois are a blue ash with exfoliating bark; a nearly non-fruiting, compact-growing, corky-barked Ohio buckeye; some hollies and magnolias.

AMONG THE AMERICAN species of *Hydrangea,* the shrubby smooth hydrangea, *H. arborescens L.,* has the widest distribution in the wild, ranges the farthest north and west (and to six thousand feet up Mount Mitchell), and has been the one most frequently cultivated, at least in America. While *H. arborescens* maintains itself both by means of seeds and by natural layering in shaded woodland sites, it is easily multiplied vegetatively, and seeds are seldom planted by nurserymen to propagate it. As with most of the other cultivated species of *Hydrangea,* the vegetative means of propagation have been employed for forms with more than the typical numbers of showy-sepaled ray flowers.

Cultivars so far introduced in this species were originally found as variants in the wild. The most widely clonally propagated of the *H. arborescens* cultivars was first taken to gardens from a southwestern Ohio location before 1900, and in 1907 described as *H. arborescens* forma *grandiflora* (A. G. Hill) Rehder; it was formerly called "Hills-of-Snow" but now is most commonly listed as 'Snowhill' in current nursery catalogs. Rehder and most recent authors have described it as having all its flowers sterile (without pistils), though Fernald (*Gray's Manual of Botany,* eighth edition) keys this and his two other described showy-flowered forms as having "all or essentially all flowers sterile and radiant."

These other "all sterile" forms in the species have received botanical descriptions, the first apparently without ever being established in cultivation, though its name has at times been misapplied to 'Snowhill'. It is *H. arborescens* var. *oblonga* forma *sterilis* (Torrey and Gray) St. John, which was collected at Wysox, Pennsylvania, by John Carey one time before 1840. A second form that differs from it in having more pubescent foliage was published in 1921 as *H. arborescens* var. *deamii* forma *acarpa* St. John, based on a herbarium collection made in 1910 by B. F. Bush in woods at "Monteer" (probably Montier, Shannon County), Missouri. One large wholesale nursery in 1960 lists this form under its synonym, *H. cinerea* var. *sterilis.*

The published descriptions are in error, at least on the sterility of the 'Snowhill' or forma *grandiflora,* and probably of other forms in *H. arborescens* and other species. Typically fertile flowers do occur, though they are easy to overlook except at anthesis and unless the large-sepaled, longer-pediceled ray flowers that comprise the larger part of most flowerheads are pried apart. Not one all-sterile-flowered head of *H. arborescens* could be found in a number of Illinois towns and cities where I observed thousands of plants, belonging to various clones and seedlings, during June and July 1960.

My observations disclosed something else unexpectedly—the presence of three other clones distinct from 'Snowhill', which also have a considerable per cent but not all of their flowers showy-sepaled. One was growing at a single Springfield location. The other two, apparently previously unrecorded in either botanical or horticultural publications, are already in rather extensive cultivation by amateur growers in various parts of central and southern Illinois, and possibly other states. These two are being given cultivar names and will shortly be available from nursery sources, since they differ enough from each other, and each is sufficiently better in habit than 'Snowhill', that they may well replace much of that popular cultivar in future propagation.

These 1960 studies of the flowering habits of the shrubby hydrangeas were inspired first by the discovery of an apparently all-showy-flowered plant of *H. quercifolia* Bartram in Etowah County, Alabama, on January 11, 1960. (Attempts are being made to propagate it.) Later, in April 1960, a casual inspection of last year's flowerheads on a 'Snowhill' bush at Urbana, Illinois, disclosed numerous opened and apparently mature seed capsules produced by primary and lateral terminal flowers. Though it was presumed that if these had matured seeds, most of them would have been dispersed during the winter, the capsules were pulverized and sowed on moist sphagnum under a polyethylene enclosure. Seven seedlings from this source are growing and should flower in 1961. These results led to more detailed examination of the flowering cymes of various *Hydrangea* species, botanical varieties, and cultivars outdoors during summer, and in the herbarium of the Department of Botany, University of Illinois. My cultivar collections in *Hydrangea* are now included in this herbarium.

'Snowhill', whenever it was examined at many Illinois locations during its 1960 flowering, invariably had cymes with almost twenty per cent of perfect flowers typical of the wild *H.*

Upper. *Hydrangea arborescens* 'Champaign' growing by the trunk of a green ash. Lower. Leaf form of *H. arborescens* 'Champaign'.

arborescens. Many of the ray flowers also produced pollen and appeared to have functional, though undersized pistils; these often had a single style rather than two, though some appeared to have the styles fused but with two stigmatic surfaces. Some may even produce fruits which will grow to maturity, as did occasional ray flowers on plants of the wild type seen in the herbarium. (All the ray flowers of a var. *oblonga* clone cultivated here produced fruits in 1960.) Others absciss above the showy sepals without opening their true petals (the latter are mostly in fours, rather than in fives as found in the typical "fertile" non-radiant hydrangea flowers). The showy sepals persist, in any case, and tend to hide most fruits which may develop from either type of flower. Since the showy ray flowers turn to face downward after the time of anthesis, the tendency is to mount them in this reversed position on herbarium sheets; this further obscures any fruits that may have developed from the not always "sterile" ray flowers.

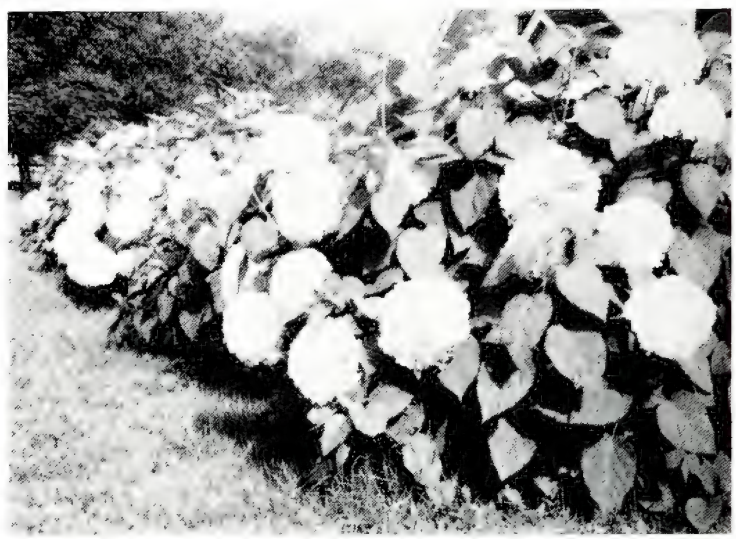
Torrey and Gray in 1840 *(Flora of North America)* noted that "sterile" flowers in the species *H. quercifolia* were often staminate. A number of other species, in addition to *H. arborescens,* also have ray flowers that bear pollen. Since they may also bear pistils, and even sometimes produce fruits, it would seem incorrect to continue calling them sterile without qualification. They are not totally sterile even in the taxonomic sense, but are rather of reduced fertility compared with the smaller, non-showy-sepaled flowers that have been previously categorized exclusively as "fertile."

The three other showy-flowered *H. arborescens* clones now found in cultivation in Illinois and western Indiana bear more of the typically fertile flowers than does 'Snowhill'. Clone Illinois 1, now registered under the cultivar name 'Champaign', bears between forty and forty-five per cent of such flowers in average cymes. Clone Illinois 2, now registered as 'Annabelle', bears about thirty-three per cent of such flowers. At its Springfield location, the third clone, Illinois 3, has between sixty-five and seventy per cent of typically fertile flowers. Occasionally cymes are found on bushes of 'Champaign' with as few as five per cent of radiant flowers. (This clone is possibly a chimera.)

Both 'Champaign' and 'Annabelle' appear to have been in cultivation in two or more Illinois counties for at least the past thirty years, without attracting the attention of any local ornamental nurseryman. Meanwhile, their offsets were being passed along to more and more amateur cultivators, sometimes in mixture with 'Snowhill'. I first noted 'Champaign' in the town of that name, where later inquiry revealed that a plant grower named Harry La Selle had been propagating it during the 1920's and recommending it as a form which stood up better than 'Snowhill'. The widow does not remember who gave Mr. La Selle his start of the clone. I have seen it as far west as Springfield, Illinois, and southeastward to Vincennes, Indiana, but it appears to be in heaviest concentration in the twin cities of Champaign and Urbana.

'Annabelle', now most abundant in and near Anna, Union County, Illinois (I saw it in seventy yards), has twice been brought to Urbana, first directly from Anna, and much later from Kinmundy, which is in the fourth county north of Anna. It is to be seen in smaller numbers in other towns between Anna and Kinmundy and as far west as Belleville, where the mother of the present cultivator brought it from a friend's yard in New Athens. I have seen 'Champaign' no farther west than Springfield, and neither it nor 'Annabelle' was found in Cairo, Illinois, thirty-seven miles south of Anna, in a survey made in early July 1960.

This considerable dispersal by private planters, before forms are taken up by commercial nurserymen, is reminiscent of the early history of the clone now called 'Snowhill', reported in *Horticulture* (1906-1908) by the late E. G.



Right. Hedge of *Hydrangea arborescens* 'Annabelle' at Urbana, Illinois.

Below. *H. arborescens* 'Annabelle' with flowers at various stages of development.

Hill, nurseryman of Richmond, Indiana. His firm was the commercial introducer of 'Snowhill' in 1906.

Mr. Hill noted that his introduction was growing before 1906 from near Kokomo, Indiana, to Allegheny City (now part of Pittsburgh), Pennsylvania, and "was widely scattered by private individuals through a stretch of country embracing Dayton, Piqua, Springfield, and Yellow Springs, Ohio." There were at that time in Ohio, he wrote, "a number of bushes in Dayton, Yellow Springs, Urbana, Springfield, and Piqua. Some, or in fact most of them, are quite ancient, judging by appearances." C. S. Sargent, in a letter to *Horticulture* (Feb. 15, 1908) verifying the distinctness of Hill's clone from the much older forma *sterilis* of Torrey and Gray, also noted that "in the Gray Herbarium there is a specimen of *Hydrangea arborescens grandiflora* collected at Nashville, Tennessee, without date or name of collector."

W. R. Van Dersal in *Ornamental American Shrubs* (1942) pictured, from an unnamed location in the wild, a still different *H. arborescens* clone in which "the flowers are all showy." Referring to the "variety *grandiflora*", he wrote that this "was found wild several times before 1900 and has been 'discovered' several times since . . . The one defect of this variety is that in some plants—but not all—the flower heads become so heavy that the stems cannot hold them erect." This defect ("mop-like" heads, in the words of Bean of Kew) applies particularly to 'Snowhill' plants fitting the 1906 picture published by Hill in *Horticulture* and the descriptions given in 1907 and 1908 by Rehder and Sargent for forma *grandiflora*. Consequently, I regard 'Snowhill' *(grandiflora)* as properly a cultivar consisting of a single clone. Forma *sterilis* (T. & G.) St. John is a different clone (possibly extinct by now, though a search in Bradford County, Pennsylvania, might be rewarding). The three other showy-flowered forms now cultivated in Illinois are clones that differ from the preceding and from each other, not only in percentages of typical fertile flowers but in other respects. Under the present rules of nomenclature, they and any additional forms of horticultural interest (including some of Van Dersal's "not all" plants, if cultivated) should receive non-Latin cultivar names, together with adequate descriptions to distinguish each of them from the commonly cultivated and currently nursery-propagated 'Snowhill' or *grandiflora*.

'Champaign' (clone Illinois 1), besides having more than twice as many typically fertile flowers, differs from 'Snowhill' in having darker green leaves, with less uniformly cordate bases, and more strongly growing stems (occasionally to six feet in one year) which hold its flatter-shaped flowerheads erect. Its ray flowers are about half as broad as those of 'Snowhill', and their sepals are not so acutely tipped. Except that it has more than forty per cent of non-radiant flowers, it greatly resembles the descriptions published for forma *sterilis*. It is a better plant than 'Snowhill' for landscaping and appears generally more vigorous. At Champaign and Urbana, Illinois, it usually bears flowers in quantity over a longer season than does 'Snowhill'. If clumps are allowed to become too thick, flowering is less abundant on new stems.

Under good culture, 'Annabelle' (clone Illinois 2) bears the most impressively showy flower heads I have seen among American species of *Hydrangea*. On new growth from established plants that have been cut back to the ground, the flowerheads are often one foot in diameter and approach a spherical outline much more closely than those of other clones. The plants have cordate leaves, larger and of darker color than those of 'Snowhill'. They have not been seen growing side by side with 'Champaign', but in Urbana they appear to average less in annual stem growth. The stems are stronger than those of comparable age on 'Snowhill,' and hold the large flowerheads more nearly erect. 'Annabelle' can readily be distinguished from 'Snowhill' by its shorter, more broadly oval sepals on showy flowers; these also have longer pedicels than most flowers of the latter. It seems to be a few days later in opening its first white flowers, and, like 'Champaign', may ordinarily remain in a showy condition longer than 'Snowhill'. It has somewhat fewer stems than 'Champaign', but as many or more than 'Snowhill', in clumps of comparable age. Both of the newly named cultivars appear to thrive somewhat better than 'Snowhill' in sites exposed to full sun, but in common with other forms of *H. arborescens* are likely to grow better in a northern or eastern exposure under central Illinois conditions. They will grow well beneath tall trees if the soil is fertile and the water supply sufficient.

Clone Illinois 3 is not yet available in sufficient quantity for introduction, and may not be worthy of introduction in competition with 'Champaign'. From the latter cultivar it differs in having fewer ray flowers on typical cymes and in shorter sepals on such flowers. Its leaves are generally cordate.

Additional cultivars originating as seedlings from the not-so-sterile showy forms of *H. arborescens* may be expected in future years. Controlled crosses can be made on the species, though the removal of stamens (advisable because the species appears self-fertile) is a rather tedious process, after the ray flowers have been cut out. Crosses with other hydrangeas are possibilities, since most of them that have been studied (by Karl Sax and some Japanese workers) have reportedly identical chromosome numbers. (Exceptions are *H. paniculata grandiflora* and *H. paniculata praecox*, both tetraploid.) One hybrid of *H. arborescens* with the silverleaf hydrangea, *H. radiata* Walt., was grown in Europe long ago; this cross could be repeated with a showy-flowered form as one parent.

It may even be possible to get hybrids with the flower colors of some of the Asian species and the hardiness of *H. arborescens*. Anyone who is interested can try open-pollinated seedlings of 'Snowhill' or one of the newer clones I have described. Gather the seed capsules as soon as they are mature in the fall, sow them as you would petunias in the spring on sphagnum or sterilized soil, and by the next year you may have some interesting new types flowering.

SPECIAL SHOWS

in the Conservatory of The New York Botanical Garden

NOVEMBER 5, 1960

Chrysanthemum Show opens and will continue through December 11, with favorable weather conditions.

DECEMBER 16, 1960

Christmas Show opens and will continue till January 6, 1961.

HOLLY IS MY WORLD

By **Ambrose Brownell**

Silver plane holly, *Ilex aquifolium argentea marginata.*

Mr. Brownell is widely known as collector, propagator, and grower of hollies. His father, the late Senator George C. Brownell, planted one of the first commercial groves of English holly in the Pacific Northwest. Mr. Brownell is a member of the Advisory Council of the U. S. National Arboretum and actively interested in the Holly Society of America. He is presenting a collection of the more winter-resistant Brownell hollies to the New York Botanical Garden.

THE REALITIES of one's life may often be traced to the most nebulous and fanciful daydreams. This is true of our arboretum of the hollies of the world. Ever since Father Brownell planted some four hundred English hollies back in 1910, to be weeded and tended on weekends and during school vacations, I have become increasingly holly conscious. Since I lived first with my father's hollies and, as the years flew by, with the thousands upon thousands added to our groves and nursery plantings, it was only natural that the study and collection of hollies from all over the world should have become my very life. With the assembling of the hollies has come the opportunity to introduce many original selections and improved varieties, and to assist in popularizing the planting of the ever beautiful hollies across America.

The commencement of this fascinating and challenging enterprise came about through sheer curiosity. Living in a region long famous for English hollies, I sought to collect as a hobby the different green and variegated types that I had observed here and there throughout the Pacific Northwest. It proved to be a delightful task, as holly owners everywhere were most generous in furnishing starts and cuttings, and I soon came to learn of the camaraderie that exists among garden enthusiasts. Even huge exotic specimens discovered on some of Portland's older estates were bought outright and moved to the arboretum. The most spectacular of these acquisitions was an ancient silver weeping holly *(Ilex aquifolium argentea marginata pendula)* hemispherical in shape, ten feet high and fifty feet around—now the pièce de résistance of the entire arboretum.

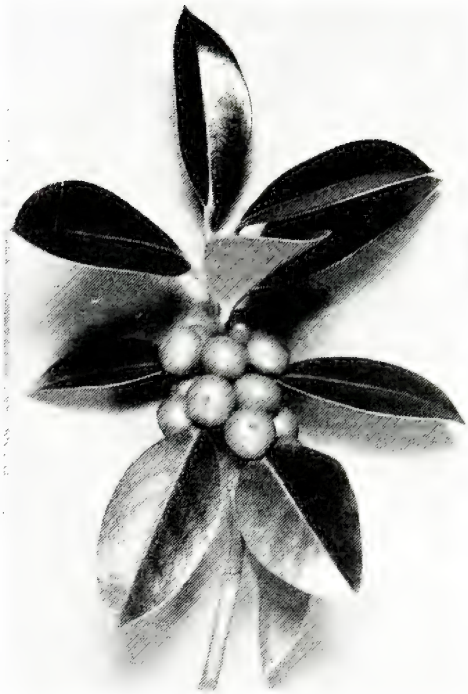
Before long my quest led me to England, where with the help of the Secretary of the Royal Horticultural Society I was placed in touch with the following nurseries, some far more than a century old: Hillier & Sons, Winchester; Fisher, Son & Sibray Ltd., Sheffield; Walter C. Slocock Ltd., Woking; J. Waterer, Sons & Crisp Ltd., Bagshot; W. Fromow & Sons, Windlesham; J. Smith & Sons, Darley Dale. Equipped with official unrestricted import licenses from the U. S. Department of Agriculture (now no longer available), I placed orders for three to five hollies of every named species and variety available. During 1947-1948 hundreds of hollies—many duplicates, of course — came through quarantine safely all the way to Oregon in huge packing crates, some weighing half a ton. What excitement, what an unbelievable array of diverse and fantastic hollies, mostly from Europe, and the Canary, Balearic, and Madeira Islands, yet many that had originated in China, Japan, India, and even America. The doors flew wide open to a whole new insight into the genus *Ilex,* as the hollies were planted and multiplied for safe keeping. Even cuttings from famous English hollies were flown in by air post; these were protected from drying out enroute by the use of orchid tubes.

Golden screwleaf holly, *Ilex aquifolium crispa aurea.*

Golden queen holly, *Ilex aquifolium aurea marginata.*

Plunged overnight from a modest hobby into a big-scale holly-growing project, and one receiving national publicity, I soon found myself overwhelmed with requests for listings and data about our new-found treasures. Correctly cataloging and describing the hollies proved to be an even greater challenge than the chore of collecting them had been. Fortunately, our efforts were well received, and over twenty

Holly 'Orange Gem'.



Holly 'Royal Red'.

Ilex aquifolium angustifolium.

Holly 'Berigold'.

thousand catalogs, illustrated in color, were mailed upon request to holly fans across America.

While our major business today is the growing and distribution of carloads of Oregon-grown Christmas holly from more than a hundred acres of commercially cultivated groves of superior horticultural varieties, my time is largely taken up by welcoming visitors to our holly arboretum and by corresponding with "pen pals" who have been bitten by the holly bug. Here I should mention the Holly Society of America that has carried out a highly commendable program for encouraging interest in the growing and care of hollies.*

At the Brownell Farms in Oregon the dreams of yester year are crystallizing into fulfillment. Pictures are being painted, not in oils, nor on textiles or ceramics, but on sweeping lawns studded with specimen hollies spaced at random: a section of gently rolling ground for the glossy-leaved aquifoliums from Europe, a southern slope for the North American species interspersed with native oaks, and a grassy valley embroidered with the dwarf crenatas and other curious hollies of the Orient. The scene abounds in color: leaves of green, silver, and gold; berries of orange and yellow, even of black, with the predominate reds in every imaginable shade.

Well over three hundred hollies, each differing from the other, have been assembled to date to provide pleasure and instruction for those who seek the beautiful and unusual. Our unique and extensive holly arboretum has long been a center of attraction for local garden clubs, and a mecca for visitors from near and far who wish to see and learn about hollies. Those with whom we have been privileged to share our hollies find that they grow not only in the soil but in the affections of their owners as well.

The Pacific Northwest, and specifically a narrow belt lying between the Cascade Mountains and the Pacific Ocean, a scant one hundred miles in width by six hundred in length, is a land of natural charm and ample rain. Verdant with evergreen flora, America's greatest region of virgin timberlands alternately basks in sparkling sunshine or is bathed in the gentle rains known locally as Oregon mist. English hollies, grown from seeds shipped around the Horn over a century ago, have rooted and flourished in this mild and temperate climate ideally suited to their requirements. The history of the Oregon country and its heritage of hollies from England a full century ago is a stirring story in itself.

Fortunately for today's holly enthusiasts, England's nineteenth-century gardeners were possessed not only of fabulously green thumbs, but of an un-

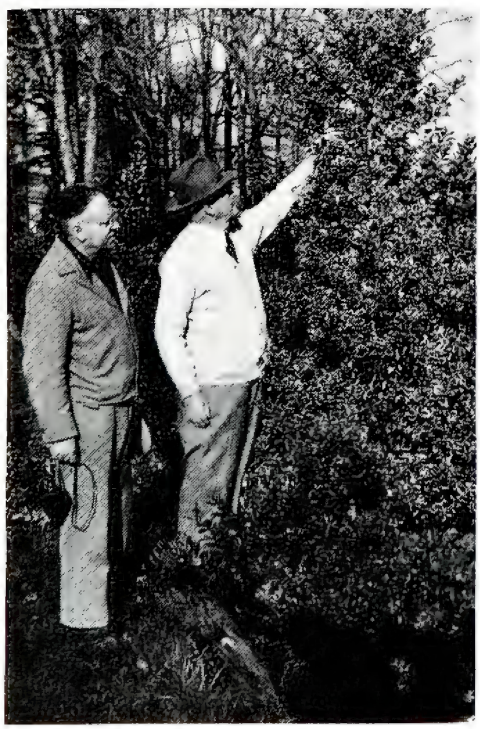
*The dues are a nominal $3.00 per year payable to Charles A. Young, Jr., Secretary, Bergner Mansion, Baltimore 16, Maryland. Membership include copies of the printed proceedings of the semi-annual meetings at which papers are presented by professional as well as lay authorities.

derstanding of and intense love for their native hollies. To further stimulate interest in hollies, annual shows were held at which England's foremost horticulturists competed for the prizes that were awarded for introductions of exceptional distinction and beauty. Vieing with one another, English nurserymen sought far and wide to extend their collections of species of *Ilex* from foreign lands, including the native American hollies.

Cooperating with the enthusiastic nurserymen in the search for new and exotic varieties were the willing hollies themselves, ever prone to mutate in bud and in seed. Almost chameleon-like, the English hollies proved to be the most versatile of all the species in changing their habits of coloration and growth. As long ago as 1874-1876 the English *Gardeners' Chronicle,* in a monumental monograph by Thomas Moore, illustrated and described over one hundred and fifty named garden varieties or cultivars of English holly *(Ilex aquifolium)*. This noteworthy treatise was followed by the publication in 1908 of *Holly, Yew & Box,* a truly masterful effort to catalog the known hollies, as well as boxwoods and yews, by William Dallimore, while he was keeper of the arboretum of the famed Kew Gardens in Surrey.

The next serious effort to perpetuate the history and lore of the hollies came almost fifty years later with the publication in 1953 of Dr. H. Harold Hume's book entitled *Hollies.* A still more recent authoritative compilation of data and information on holly is found in the special issue (January 1957) of the *National Horticultural Magazine*: this was edited by Harry William Dengler of the University of Maryland. Other able scientists who are now contributing to the knowledge of the hollies are: Dr. Shiu-ying Hu, associated with the Arnold Arboretum and specializing in the hollies of the Orient; and Dr. William F. Kosar, with the U. S. National Arboretum in Washington, D. C., famous for his work in plant breeding and especially in holly hybridizing.

The author, Ambrose Brownell, and Dr. H. Harold Hume examine *Ilex aquifolium argentea marginata* or silvary holly.



Many species compose the genus *Ilex* and thousands of varieties have been named and described by botanists and horticulturists of many nationalities. Hollies abound on every continent but Australia. For the benefit of the neophyte approaching the "Holly Kingdom" for the first time, it may be helpful to describe a species of holly as a kind that will reproduce itself from seed with reasonable fidelity.

Species names are always in Latin. Thus *Ilex aquifolium,* commonly referred to as English holly, when translated literally means that it is a holly whose leaves are armed with needles. The name *Ilex cornuta,* or horned holly, aptly describes the prominently projecting lateral leaf spines that appear on either side of a depressed tip spine, normal and conspicuous characteristics of this popular species from China. *Ilex monticola*, a deciduous native holly is commonly called mountain holly; the second half of its name means "inhabiting mountains." The name *Ilex integra* refers to the "entire" (lacking teeth or lateral spines) leaf of this soft and lovely Japanese species. *Ilex opaca,* the best-known of the twenty or more North American species, is generally lacking in the leaf luster or gloss so much admired in the English hollies. Horticultural varieties of hollies are groups within a species. They arise through variations among seedlings and those obtained by propagation of mutants or bud sports. When the new characteristics appear to be worthy of perpetuation, and are propagated vegetatively, a clone is produced and may be given a descriptive name or epithet, added to that of the species. Thus *Ilex aquifolium* 'Rederly' is the name of an unusually beautiful and early-ripening English holly that I introduced to the nursery trade in 1935.

Silver Weeping Holly, *Ilex aquifolium argentea marginata pendula.*

Other forms of hollies are derived from both the natural (putative) or artificial (planned) hybridization of *Ilex* species. Here lies a fertile field for skilled plant breeders, and I predict the appearance of new and exciting interspecific hybrid hollies within the coming decade. Several putative or apparently accidental natural hybrids are already in the trade. Many planned crosses are cropping up every year, and the new hybrids are generally distinguished by exceptional vigor of growth and resistance to extreme heat and cold. It is not unlikely that hollies will be produced in the near future that can be safely planted with a minimum of care and protection, to provide beauty and joy in areas where hollies are virtually unknown because of adverse growing conditions for the less winter-hardy types.

As one examines closely the evergreen hollies, he will be amazed at the diversity in shape, size, and substance of leaf, even in the varying shades of green, and in the waxy surfaces ranging from a lustrous gloss to a dull flat finish. Other variable characteristics include

color of berries and their shape, size, firmness, and placement along the branch; color of twig bark; and general growth habits, such as fastigiate or columnar, pendulous or weeping, arborescent or shrubby, or even naturally dwarfed. Assaying these many points of difference results in certain criteria for the evaluation of any single holly. We who know our hollies by living among them have assumed the challenging role of judge as we pursue our quest for the most beautiful, interesting, or useful hollies to be selected for naming and perpetuation.

These named clones, which are extensions of a single specimen holly on independent root systems, possess great value to the grower, who is thus enabled to share his prized hollies with all who come to admire them. Fortunately the hollies respond readily to asexual or vegetative reproduction. Various methods are employed according to the material available: layering, budding, grafting, and the rooting of cuttings. Sources of clones are seedling hollies from either natural or controlled breeding, and bud sports. It is an exciting, rewarding experience to discover a "beauty queen" among thousands of sister seedlings, or a spontaneous mutant twig, one of nature's unheralded whims, appearing seemingly out of nowhere to display leaves of green transformed to silver and gold.

Each seedling holly when mature will prove to be either male (staminate) or female (pistillate), for hollies are dioecious; the two sexes are formed on separate plants. The reproductive function of the male hollies is to furnish the pollen necessary for the fertilization of the ovules borne in the pistillate flowers of the female hollies. The male hollies are incapable of fruiting. The "berries" are really drupes and conceal within their pulpy interior generally four nutlets, each containing a seed. The proximity of a male, either as a separate tree or as a branch budded or grafted upon a female tree, is essential for the production of fertile seeds. As a temporary expediency, a bouquet of flowering male branches kept fresh in a can of water can be hung from the limbs of an unattended female holly. Bees and other insects seeking honey from the nectaries of the holly flowers are invaluable if unwitting agents in

(Continued on page 233)

The male flowers of the English holly, *Illex aquifolium*, greatly magnified.

The female flowers of the English holly, *Ilex aquifolium*, greatly magnified

A NEW INTEREST IN BIGENERIC HYBRIDS

By **Paul Arnold**

Mr. Arnold is a grower and hybridizer of gesneriads at Binghamton, New York, and is the International Registrar for the *Gesneriaceae,* excluding *Saintpaulia.*

HOUSE-PLANT GROWERS in the United States, understandably enthusiastic about modern developments in the large size and remarkable colors of florists' gloxinias, are also showing an upsurge of interest in the hybrid genus × *Gloxinera.* Amateur hybridizers, rather than professional plant breeders, have produced in the last few years an astonishing number of new gloxinera forms. These new hybrids exhibit a considerable range of color and pattern resulting from crosses of sinningias with rechsteinerias, some of which had not previously been reported as parents of gloxineras. The appearance of several F_2 hybrid gloxineras has demonstrated the fertility of many of these bigeneric crosses.

The hybrid genus × *Gloxinera* was established in 1895 by John Weathers (*Gardeners' Chronicle* Ser. 3. **17**:144) who combined two now obsolete generic synonyms to produce the name. For the sake of euphony, we can be glad that Mr. Weathers could merge the two names, *Gloxinia* and *Gesnera,* and was not required to devise a name, under the International Code, which would combine the names now current for the genera, *Sinningia* and *Rechsteineria.*

Fig. 1. *Gloxinera 'Brilliant'*, reproduced from the *Gardeners' Chronicle,* 1895.

The plant celebrated by John Weathers in 1895 was *Gloxinera* 'Brilliant', raised in Chelsea, England, at the establishment of James Veitch and Sons. To produce the plant, a florists' gloxinia named 'Radiance' was fertilized by Veitch's foreman West with pollen from *Rechsteineria (Gesnera)* 'Pyramidalis'.

The 1900 Supplement to Nicholson's *Dictionary of Gardening* describes the plant: "The flowers are of the usual size of the Gloxinia, horizontal in position, and of a rich carmine-crimson colour. The foliage is intermediate between the parents, and decidedly ornamental." The life-size picture with which Weathers illustrated his description in the *Gardeners' Chronicle* (Fig. 1) shows a "slipper-type" florists' gloxinia with typical leaves and flowers. The fact that *Gloxinera* 'Brilliant' does not resemble both parents has led to recent speculation that it may not have been a genetic cross but merely a product of apomixis. The modern gloxineras, on the other hand, like the first gloxinera of record (× *Gloxinera gesnerioides* of 1846) have forms intermediate between their parents (Fig. 2), and the resemblance to both parents persists in F_2 hybrids which have recently appeared as the result of breeding some of the new gloxineras back to one of their progenitors.

Dr. Harold E. Moore, Jr., of the Liberty Hyde Bailey Hortorium at Cornell University, summarized in 1954 (*Gentes Herbarum,* 8: 397) the gloxineras that had been recorded in the botanical literature up to that time, but under different names. He made two new combinations that had been overlooked by John Weathers in 1895, namely:

× *Gloxinera donkelaariana* (Lemaire) H. E. Moore, raised by Donkelaar, Jr., Head Gardener at

Fig. 2 *Gloxinera* 'Longiflora' (center) with the pollen parent, *Sinningia eumorpha,* on the left, and the seed parent, *Rechsteineria cardinalis,* on the right, was produced in 1955 by Cornelius Ackerson in Keyport, New Jersey. It has been back-crossed successfully with *R. cardinalis,* but not with *S. eumorpha.*

Fig. 3. The Classic *Gloxinera* 'Bernice' has the same parentage as the Reciprocal *Gloxinera* 'Longiflora'. The characteristics of the seed parent predominate in each case. Flowers of 'Bernice' resemble those of slipper-type sinningias more than they do flowers of *Rechsteineria cardinalis*.

the University Botanical Garden, Ghent, Belgium, in 1849, from *Rechsteineria discolor* ♀ × *Sinningia speciosa* 'Rubra' ♂.

× *Gloxinera gesnerioides* (Lemaire) H. E. Moore, pictured in *Flore des Serres* (February 1846) without indication of its origin but described as a product of *Rechsteineria cooperi* ♀ × *Sinningia tubiflora* ♂.

In this same paper, Dr. Moore ushered in the modern wave of breeding activity that has led to the production of many new gloxinera forms. He described an interesting intergeneric hybrid produced at Fantastic Gardens in South Miami, Florida, in 1954 by Robert G. Wilson. This contemporary hybrid was designated × *Gloxinera rosea* H. E. Moore and R. G. Wilson. The seed parent was *Sinningia eumorpha,* fertilized by pollen from *Rechsteineria (macropoda) cyclophylla.* The use of *S. eumorpha* as a progenitor for gloxineras opened up a whole new world of plant breeding.

Fig. 5. A 'Harold Hybrid' gloxinera produced by fertilizing the original seed parent, *Sinningia eumorpha* with pollen from *Gloxinera* 'Harold'. The latter had *Rechsteineria* 'Splendens' as the pollen parent. This unnamed seedling has white flowers illuminated by long scarlet hairs, particularly near the base of the tube.

Contemporary Gloxinera Clones

The cross that Wilson made in Florida was repeated at Cornell University in Ithaca, New York, and elsewhere. A seedling of × *Gloxinera rosea* was selected for clonal reproduction and named *Gloxinera* 'Rosebells' by Mrs. Peggie Schulz of Minneapolis, Minnesota. That cultivar name was published, with a brief description, in *The Gloxinian* (May-June 1955), and clonal propagations of the plant were offered for sale by the seedsmen Geo. W. Park of Greenwood, South Carolina, in their 1956 catalog.

The publicity given in 1955 to the appearance of *Gloxinera* 'Rosebells' inspired a great deal of activity among house-plant breeders. Many different gloxinera cultivars have been produced, described, and named in the ensuing five years. Three of them, 'Coral Gem', 'Harold', and 'Bernice' (Fig. 2), have been registered with the International Registration Authority.

Apart from the basic fascination which the whole subject of intergeneric hybrids naturally has for plant breeders, the fact that these "mules" in the gesneriad family are usually fertile has been a stimulant to the creation of many different gloxineras. Additional factors that contribute to this activity in amateur plant breeding are:

Fig. 4. A 1958 Reciprocal cross made by Peggie Schulz of Minnesota. *Sinningia eumorpha* was the pollen donor, but the plant closely resembles the seed parent, *Rechsteineria* 'Purpurea'. In Classic crosses between the same two parents, Mrs. Schulz has produced dwarf plants with small leaves and two-inch long flowers of imperial purple.

1. The Ease of Propagation. Both sinningias and rechsteinerias produce flowers with sexual parts which are easily accessible and of conveniently large size. The flowers of both parents can be brought into bloom, by proper management, at the same time and during any chosen month of the year. With only nine months or a shorter period between seeding and flowering, the results of a cross become available without an intolerable wait. In addition, neither *Sinningia* nor *Rechsteineria* flowers are normally self-pollinated, and emasculation is quite easy to accomplish.

2. A Great Variety of Form and Color. Both sinningias and rechsteinerias occur in a wide spectrum of flower colors, from brilliant saturated hues to the softest pastel tints. The size and forms of the flowers extend over a wide range in both genera. The habits of the plants and their leaf and stem characteristics offer further opportunities to the plant breeder in developing new forms.

Three Classes of Gloxineras

For convenience in discussing the several types of gloxinera crosses which are popularly grown today, they have been classified in three groups: (1) the Classic Group, characterized by the original *Gloxinera* 'Brilliant', in which a *Sinningia* is the seed parent, fertilized by pollen from a *Rechsteineria.* (2) the Reciprocal Group, in which a *Rechsteineria* is the seed parent, and the pollen comes from a *Sinningia;* the registered *Gloxinera* 'Coral Gem' is an example of the Reciprocal Group. (3) the Complex Group, including F_2 gloxineras in which both Classic and Reciprocal crosses have been backcrossed with one of the parents, along with selfed gloxineras and other possible combinations.

The Classic gloxineras are listed in Table I. All the clones that have *Sinningia eumorpha* as the seed parent are currently grown in the United States, and most of them are commercially available. Apparently none of the contemporary plant breeders has succeeded in reproducing the *Gloxinera* "Brilliant' cross, which would call for the use of *Sinningia speciosa,* or else one of the florists' gloxinias of complex ancestry, for the seed parent. On the contrary, several experimenters have indicated in conversation and correspondence that they have consistently failed, despite repeated attempts, to produce gloxineras by using florists' gloxinias or any other sort of *Sinningia* except *S. eumorpha.*

The list of Classic gloxineras includes four cultivars which have the same general parentage. Although the breeding was done at three different places, *Sinningia eumorpha* was the seed parent in each cross, and some form of *Rechsteineria cardinalis* served as the pollen donor. Both gloxineras 'Harold' and 'Velvet Charm' were selections from the seedling population of a single cross made in Ithaca, New York, using *Rechsteineria cardinalis* 'Splendens' as the pollen parent. Two other *R. cardinalis* clones of unknown distinction have been used as pollen parents for *Gloxinera* 'David' and *G.* 'Bernice'. The latter was raised in California but not at Sebastopol, which was the home of *Gloxinera* 'David'. The four gloxineras are distinct in appearance despite their similarity of parentage. For example, *Gloxinera* 'David' is a larger, more robust plant than *G.* 'Bernice', and the flowers have markings in the throat which resemble those of *R. cardinalis,* while the flowers of 'Bernice' are marked inside like the flowers of *Sinningia eumorpha.*

Some Reciprocal crosses which have been successful in producing gloxineras are shown in Table II. Only one of these, 'Coral Gem', is in the trade. The plant was raised in 1957 by Mrs. Catherine B. Shepherd of Arlington, Virginia, from a cross made the previous year. The cultivar name was selected and registered in 1958, and the plant was first offered for sale by the House of Plants in 1960. An unnamed Reciprocal gloxinera of unusual parentage is shown here (Fig. 4). Donkelaar's 1849 hybrid long ago disappeared from cultivation, and no record has been found that the cross has been successfully repeated in recent years.

Some New Complex Gloxineras

The only exception to the current record of frustration in using sinningias or florists' gloxinias as parents for gloxineras comes from Bruce A. Thompson of Philadelphia, the President of the American Gloxinia Society. Using *Sinningia regina* hybrids in his breeding program, Mr. Thompson has produced a number of Complex gloxi-

Table I
CLASSIC GLOXINERAS WITH SINNINGIA AS THE SEED PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
S. tubiflora	*R. cooperi*	unknown	'Gesnerioides'[1]	1846
S. speciosa	*G. donkelaariana*	unknown	'Gesneroides'[2]	1884
S. speciosa	*R. pyramidalis*	James Veitch	'Brilliant'	1895
S. eumorpha	*R. cyclophylla*	Peggie Schulz	'Rosebells'[3]	1955
S. eumorpha	*R.* 'Splendens'	Peggie Schulz	'Velvet Charm'	1956
S. eumorpha	*R. cardinalis*	Reynolds Gardens	'David'	1957
S. eumorpha	*R.* 'Splendens'	House of Plants	'Harold'	1958
S. eumorpha	*R. cardinalis*	Don Horton	'Bernice'	1958
S. eumorpha	*R. warszewiczii*	Rodda Gardens	unnamed (seed)	1959
S. eumorpha	*R.* 'Purpurea'	Peggie Schulz	unnamed	1959

1. The name × *Gloxinera gesnerioides* (Lemaire) H. E. Moore was a combination made in 1954 by transfer of Charles Lemaire's *Gloxinia* × *gesnerioides* of 1846 to the hybrid genus × Gloxinera of Weathers.

2. The *Gloxinia gesneroides* that appeared in Nicholson's *Dictionary of Gardening* (1885) differed in more ways than spelling from *Gloxinia* × *gesnerioides* of Lemaire in *Flore des Serres* (1846). The latter had *Sinningia tubiflora* and *Rechsteineria cooperi* as parents. Dr. Moore has accepted an 1884 report from Germany that the plant pictured by Nicholson was an F_2 hybrid gloxinera resulting from *Gloxinera donkelaariana* backcrossed with *Sinningia speciosa.* Other writers have stated that the *Gesnera donkelaarii* Hooker, which went into the cross, was not Donkelaar's gloxinera of 1849 but a native rechsteineria which was imported from Colombia by James Veitch and Sons, first flowered in 1858, was accepted by Sir W. Hooker as a species (*Botanical Magazine* t. 5070, 1858), and named because of its resemblance to the plant already known as *Gesnera donkelaarii.* Those who incline to the latter view would accept the *Gloxinia gesneroides* of Nicholson as an F_1 *Gloxinera.*

3. The first example of × *Gloxinera rosea* H. E. Moore and R. G. Wilson was produced by Robert G. Wilson in 1954. Some plants of two different clones were retained for propagation at Fantastic Gardens in Florida and subsequently distributed without cultivar names. A more recent cultivar claimed to have this same ancestry was *Gloxinera* 'Nancy Kaye', first mentioned in *The Gloxinian* (Sept.-Oct. 1958).

Table II
RECIPROCAL GLOXINERAS WITH RECHSTEINERIA SPECIES AS THE SEED PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
R. discolor	*S. speciosa* 'Rubra'	Donkelaar	'Donkelaariana'[1]	1850
R. cardinalis	*S. eumorpha*	Ackerson	'Longiflora'	1955
R. cyclophylla	*S. eumorpha*	Shepherd	'Coral Gem'	1956
R. 'Purpurea'	*S. eumorpha*	Schultz	unnamed	1959
R. leucotricha	*S. eumorpha*	Ackerson	unnamed	1960

1. The transfer to × *Gloxinera* from Charles Lemaire's name *Gesnera donkelaariana* was made by H. E. Moore in 1954.

neras (Fig. 5). Some of the Thompson named cultivars are included in Table III. Mr. Thompson used as pollen parent a *Sinningia regina* seedling which has reddish flowers. This plant had resulted from crossing *S. regina* with a red-flowering hybrid slipper-type sinningia and back-crossing the progeny (for two successive generations) with *S. regina.* Although the pollen parent of *Gloxinera* 'Clarice T' and its sister plants contains only a fraction of red-flowering ancestry, along with a preponderance of purple-flowering *Sinningia regina* parentage, the red color has persisted in the third generation of this interspecific hybrid sinningia. The effect of the dominant red coloring is strikingly evident in the gloxinera generation and adds greatly to the appearance of the flowers.

Recreation of Old Hybrids

Another Classic gloxinera, first reported in 1846, had been repeated in 1957 but, through misfortune, was again lost to cultivation. Viable seed was obtained from this Classic cross in which *Sinningia tubiflora* was used as the seed parent and fertilized by pollen from *Rechsteineria cardinalis.* The Reciprocal cross, with the same progenitors, resulted in a swollen ovary, but none of the matured seed appeared to contain any germ, and no plants resulted. Four plants of *Gloxinera gesnerioides* from the Classic cross were raised to flower bud stage in 1958, but all were lost through inattention while I was overseas during that June.

The geneticist Dr. Sheldon C. Reed of St. Paul, Minnesota, writing in *The Gloxinian* (Jan.-Feb. 1960) has observed that when gloxinera hybrids between *Sinningia eumorpha* and *Rechsteineria cyclophylla* are back-crossed with *S. eumorpha,* the resulting F_2 progeny very often have white flowers covered with "an interesting 'velvet' of red hairs" on the outer surface. The occurrence of scarlet hairs on white flowers is generally characteristic of the progeny that result when *Gloxinera* 'Harold' is back-crossed with *S. eumorpha,* though the red hairs (in this case an inheritance from *R. cardinalis*) are of too great a length and too widely spaced for most people to characterize them as a "velvet." Figure 5 shows a typical 'Harold Hybrid' gloxinera having red hairs on a white tube.

Not all the 'Harold Hybrid' gloxineras have red hairs on white flowers, however. Sister plants to the one shown in Figure 5, raised from the same seed capsule, have shown white hairs on a white tube. Occasionally the tube itself is stained a faint pink color (with white hairs), and one plant had flowers with white hairs on a tube which was uniformly tinted pale bluish violet. In addition, the forms of the flowers differ considerably among the progeny of *Gloxinera* 'Harold' back-crossed with *Sinningia eumorpha.* It is the observance of such differences that provides the amateur breeder of gloxineras with some of the fascination that he feels in this pursuit.

Dr. Reed has pointed out, in the same article, that *Sinningia eumorpha* has an affinity for various *Rechsteineria* species which is not shared with other sinningias. He reports repeated failure in trying to cross *S. eumorpha* with other sinningias. Dr. Reed's experiences provide a genetic clue which should aid other investigators in answering some of the many questions that have been raised all during the past century, and even longer, about the taxonomy of the various plants within the presently accepted boundaries of *Sinningia.*

In the century from 1846 to 1947, only four examples of the hybrid genus × *Gloxinera* have been described in the literature. Including the items that are mentioned here for the first time, some twenty-six different gloxineras have been reported since 1954. This recent enthusiasm for crossing sinningias with rechsteinerias and with the resulting gloxineras exists for the most part among amateur horticulturists. These experimenters are serious workers and, despite their lack of professional training, keep at least minimal records of their crosses; many of them work with great care and precision. Some of them are conscientious about registering their introductions, and a few are proficient in writing accounts of their achievements for gardening publications which are always happy to publish stories about new plants. Consequently, there is building up a body of miscellaneous information about the performance of various species in the breeding of these interesting bigeneric hybrids, which may be of use to future researchers in genetics and taxonomy. To that increasing store of information, this contribution is hopefully added.

Table III

COMPLEX GLOXINERAS HAVING A GLOXINERA AS ONE PARENT

Seed Parent	Pollen Parent	Grower	Cultivar Name	Date
Sinningia eumorpha	*Gloxinera* 'Velvet Charm'	Rodda Gardens	unnamed (seed)	1959
Sinningia eumorpha	*Gloxinera* 'Velvet Charm'	Yoars Nursery	unnamed (seed)	1960
Sinningia eumorpha	*Gloxinera* 'Rosebells'	S. C. Reed[1]	unnamed	1960
Sinningia eumorpha	*Gloxinera* 'Harold'	House of Plants	'Harold Hybrids'	1958
Gloxinera 'Rosebells'	selfed	Peggie Schulz	'Pink Parfait'	1957
Gloxinera 'Velvet Charm'	*Rechsteineria* 'Splendens'	Peggie Schulz	unnamed	1960
Gloxinera 'Velvet Charm'	*Rechsteinaria warszewiczii*	Rodda Gardens	unnamed (seed)	1959
Gloxinera 'Longiflora'	*Rechsteineria cardinalis*	Ackerson	unnamed	1958
Gloxinera 'Longiflora'	*Rechsteineria leucotricha*	E. J. Farwell	unnamed	1958
Gloxinera 'Harold'	*Sinningia eumorpha*	House of Plants	'Harold Hybrids'	1958
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Edith M'	1959
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Clarice T'	1960
Gloxinera 'Rosebells'	*Sinningia regina*	B. A. Thompson	'Rita L'	1960
Gloxinera 'Rosebells'	*Sinningia eumorpha*	Peggie Schulz	'Bonbon'	1957
Gloxinera 'Rosebells'	*Sinningia eumorpha*	Peggie Schulz	'White Dove'	1957

1. Reported in *The Gloxinian* (Jan.-Feb. 1960), grower not stated.

A JUNE DAY ON MT. WASHINGTON

By **Doris G. Schleisner**

Mrs. Schleisner is daughter of Samuel H. Gottscho and wife of William Schleisner of the widely known photographic firm of Gottscho-Schleisner. She has accompanied them on many of their trips to photgraph plants and gardens and has written on native plants for magazines and newspapers.

AMONG THE thousands of ski enthusiasts whose destination at least once this winter will be Mt. Washington, monarch of the great Presidential Range of New Hampshire's White Mountains, some will make a return trip in June. Their interests run to things botanical. Stout hiking shoes will replace ski boots, for June is a month when nature lovers explore on foot the upper slopes of Mt. Washington and the adjacent peaks. Here, above timberline, they will find in bloom the earliest-flowering and some of the loveliest of the rare alpine plants (others bloom during July and August) that make of these higher summits small islands of arctic flora in the temperate zone.

The story of this unique flora which is composed of about forty-five species dates back to the Ice Age. As the great sheet moved down from the north, it carried with it many arctic plants which were distributed through New England. With the retreat of the glacier, most of the plants likewise retreated to their arctic homes. Above timberline on the highest Presidential Range peaks, where temperature and climatic conditions match those prevailing on the Atlantic Coast of northern Labrador, these alpine plants were able to survive. Those that bloom this coming year are lineal descendants of parent plants that bloomed thousands of summers ago.

These dainty blossoms are for the most part delicately hued and minute in stature, seemingly so fragile, yet able to withstand severe cold, strong winds, and deep snow. Far different from the brilliant flowers that paint the alpine meadows of the High Sierra and the Alps, they possess an elusive charm all their own which has lured many botanists and nature lovers to the craggy heights where they grow.

Whether on foot, or by rail on the famous Cog Railway, or by car on the equally famous Summit Road, the ascent of Mt. Washington to the alpine zone and the summit is an unforgettable experience. The climb, which is breath-taking as the "epic landscape" comes into view, has a particular fascination for everyone interested in the natural sciences. Telescoping time, distance, and climate (one hundred feet up a mountain equals ten miles north, three hundred feet up a mountain brings a drop of one degree Fahrenheit), it takes the visitor on a botanical trip some six hundred miles to the north.

The ascent by car on the Summit Road begins among green, daisy-dotted fields; then quickly passes into a dense forest of tall fir and spruce. Along the edge of the road for car passengers to enjoy are some of the June blossoms of the evergreen north woods—twinflower *(Linnaea borealis),* clintonia *(Clintonia borealis),* bunchberry *(Cornus canadensis),* partridge berry *(Mitchella repens)*, and wintergreen (*Gaultheria procumbens*). Gradually, as the road makes its circuitous climb, the forest thins out, and the trees become smaller and smaller.

At about four thousand feet trees are scarcely recognizable as such—spruce and balsam and birch appear more like shrubs than trees. Growing horizontally to conserve warmth and moisture, their branches spread out for many feet, covering rocks and boulders and forming thick, interwoven mats. Finally, at forty-eight hundred feet, even these dwarf trees disappear. Timberline has been reached, and the zone of alpine plants begins.

Not from a car window but on foot and cautiously must this fascinating terrain be explored. It is a strange land of unreal contrasts—Lilliputian growth in a Gargantuan setting. Willows, birch, and spruce measure three inches high, yet may be seventy-five years old; for here, where the wildest tempests rage, plant survival depends upon exposing as little surface to the wind as possible.

Those who come to this unique realm for the first time have difficulty, to be sure, in keeping their eyes on the ground, for there is grandeur to be seen by looking straight ahead. On a cloudless June day the air is cool, the sun hot, and the sky of deepest blue. Only the droning of flies and the plaintive notes of a white-throated sparrow break the profound stillness of these solitary heights.

In such a setting even the common-

Diapensia, alpine-azalea, and Labrador-tea near the summit of Mt. Washington.

est roadside weed could achieve distinction, let alone the rare and dainty alpines. Glowing softly against the stark granite boulders are the tiny crimson bells of the alpine-azalea *(Loiseleuria procumbens)*. A member of the Heath Family, this dwarf, almost prostrate evergreen shrub weaves its short branches into dense tangles which spread over the rocks and cover the ground.

Nearby larger deep pink blossoms stand erectly about six inches above the ground; these belong to another heath, the pale bog-laurel (*Kalmia polifolia)*. Though this is found in Greenland, this pretty laurel is not strictly an alpine, for it grows as far south as New Jersey, where it may reach a height of twenty-two inches.

Labrador-tea *(Ledum groenlandicum)* grows above timberline wherever it can find some shelter from the violent winds. Even when the clusters of small white flowers are not in bloom, this low evergreen shrub is easily recognized by the brownish, hairy under surface of the leaves. A true alpine, and said to be the flowering plant that approaches nearest to the North Pole, Labrador tea is also at home as far south as New Jersey.

Just because they are not alpines is no reason to ignore bunchberry and Canada mayflower *(Maianthemum canadense)*. Here on the heights they are tiny replicas of their lowland relatives, but none the less charming as they colonize on the soft carpet of lycopodium, sphagnum, and reindeer moss that covers the ground.

The road winds higher up to fifty-nine hundred feet, not yet the summit but deep within the alpine zone. Here diapensia *(Diapensia lapponica)* is still in bloom in June among the tiny alpine sedges and mosses that grow over the rocks. This is one of the earliest alpine plants to flower, blooming in the wake of melting snow; the dainty white blossoms are seen in June only on the chilly heights close to the summit. Even when bloom has passed, diapensia is recognizable by the dense little ground mats of tiny leaves and inch-high yellow seed pods.

One of the botanical highlights of a June day atop Mt. Washington is finding the lovely Lapland rose bay *(Rhododendron lapponicum)* in bloom. One of the less common alpines, this diminutive of the great rose bay often grows in almost inaccessible crevices of rocky ravines which only the most experienced mountaineer dares to approach. There the little two-inch plant opens its light purple flowers.

The road twists upward to the summit—6,288 feet above the green, daisy-dotted fields where it began. Here are no green fields—only grim, bleak piles of rocks where, it would seem, nothing but lichens could grow. Yet even in this wasteland nature proves its tenacity. Blooming wherever there is a bit of pulverized rock are the little snow-white flowers of the mountain sandwort *(Arenaria groenlandica)*.

HOLLY (from page 227)

accomplishing the transfer of pollen from male flowers to female flowers.

Considerable confusion exists over the importance of male hollies to assure fruiting, for female hollies can bear infertile (parthenocarpic) berries to varying degrees. Some species, such as *Ilex cornuta,* are capable of producing heavy clusters of these barren fruits with blank and hollow nutlets (pyrenes). On the other hand, *Ilex opaca* is quite reluctant to form any fruits unless the seeds within are fertile. English hollies differ widely in this respect. For example, the silver-variegated aquifoliums rigidly require fertilization before producing any berries, but some green-leaved female varieties are prone to fruit fairly freely without fertilization. No commonly known holly, however, is self-fertilizing, monoecious, hermaphrodite, or bisexual, regardless of repeated claims to the contrary. The proper descriptive term for a holly that bears infertile seeds is "self-fruiting" rather than "self-fertilizing."

Let us now assume that you have selected for adoption a "Princess Ilex" and her "Prince Consort" to assure their fruiting and perpetuation, and that you want to know about choosing just the spot for them to appear at their best. In southern states, "Princess Ilex" will need some protection against the burning afternoon sun; in the more temperate climate zones, full exposure is prescribed; in the northern states, extra protection must be provided against the frigid blasts of winter. In the sheltering lee of your home, and preferably with a northern exposure to avoid the damaging effect of frequent thawing, the hollies should flourish.

When to plant is both a good and a common question. With all-weather pot-grown hollies planted and growing upon delivery, it is quite a temptation to encourage one to plant holly any month in the year. The best time for planting, however, is when the roots are active and growing, generally from February to October. During these months, the roots will strike out vigorously and securely anchor the trees in their new environment. Except perhaps in the more southerly states, hollies become semi-dormant throughout the late fall and winter months, and they are transplanted then with the hazard of becoming winter casualties. Deep mulching, wrapping with straw and burlap, overlaying with leaves and boughs, encasing with ventilated plastic covers, and spraying with plastic coatings to restrict transpiration are among the true gardener's "bag of tricks" to bring his hollies unharmed through the worst that cruel winter sometimes serves.

Other do's and don'ts that can never be repeated too often are to be liberal with water as you plant hollies and generous, too, with soil to fill in about their sturdy roots. For *Ilex* is a vigorous grower and will respond to your every thoughtful ministration. Plant *Ilex* high above ground level to compensate for future settling, as the soil around and beneath becomes compacted by successive waterings. Sunken hollies will suffer from root rot and lack of soil aeration. Remember, too, that *Ilex* simply will not tolerate wet feet. As you complete the planting, cup, but never dome, the soil about a holly; remember that a cup holds water, a dome sheds water. Then remember to water again and again until roots and soil are firmly cemented together, and earth's capillary action restored.

Here are a few tips to help you learn the language of the hollies. They are surface feeders, whose roots fill the top soil beneath the spread of protecting limbs. Be sure to provide a cover or mulch to prevent the surface roots from drying, burning, or freezing. As they mature, they will mulch their own roots with the worn and older leaves that they shed, so never spade about your hollies nor cultivate too deeply. If the trees are tall, or exposed to winds,

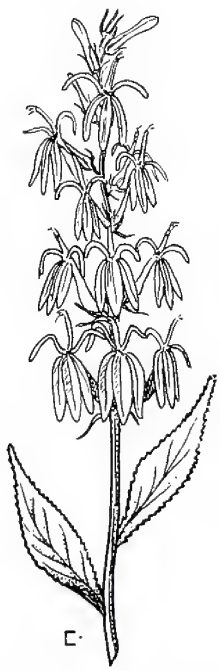
stake them securely until they become well anchored, after which they will withstand gales of hurricane force. Feed sparingly at first, later more, but always a balanced ration. When hollies lack minerals, their leaves lose luster, and if they are long neglected they will become pale. Avoid fall feeding, for late growth renders hollies soft and susceptible to winter cold.

Whatever your fancy dictates or whatever problems your landscaping poses, there is just the right holly for you. The English hollies, preferred for their wavy leaves of glossy green and their heavy clusters of sparkling red berries at the Christmas season, are today being widely planted throughout the United States. Pot-grown named varieties from proven winter-hardy stock are receiving wide acceptance in areas once thought to be inhospitable to English holly.

A Country Housewife's Garden

By

Gertrude B. Foster



IT STARTED with a "baby-blessing" bouquet I made up for my niece's new baby. My niece now wants to grow the herbs that smelled so good in the little nosegay, in a garden of herbs at her new home in Saudi Arabia. Some of the pungent plants chosen for the old-fashioned bouquet, because of their legendary meaning, would be quite at home in that part of the world. Rosemary, for example, grows wild in the Jordan Valley; but others, such as mugwort, might not do so well in a hot climate. Mugwort had been included in the bouquet with a special meaning to wish the new born son good traveling. "A leaf of mugwort in the shoe means that you can walk forty miles before noon without tiring," says the legend. Rosemary for a good memory, balm for good cheer, sage for long life, chamomile for a strong stomach, borage for courage, strawberry for perfection, and love-in-a-mist or devil-in-the-bush for mischief—these were the ingredients of the "baby-blessing" bouquet.

Amid larger floral tributes to the mother and child the herbs attracted great attention from visitors and nurses. The young mother had to explain the meaning of each one over and over. The fragrant leaves and few flowers were surrounded by a lace-paper doily and tied with a dainty bow. I was delighted to learn that my small offering was carried home from the hospital so that each sprig might be pressed and put away with the congratulatory cards. Evidently the message to be found in a little "tussie mussie" meant just as much to a modern matron as it did in olden days when the language of flowers was the subject of books. *Flora's Lexicon* is the title of one such gem. I was surprised to find mentioned in this nineteenth century volume our native cardinal-flower "for distinction." I might have added a few leaves of grape "for mirth" as background for the nosegay of herbs, if I had not used the paper filigree.

Packets of herb seeds will make an interesting Christmas gift to be taken back to the desert land where no religious services can mark the Christian holy day. I have given quite a bit of thought about what to select for this beginner's garden to be planted in Jeddah, thirty miles from the Moslem holy city of Mecca. Once I sent basil seeds to be planted in a salad garden. They sprouted in two days and grew so rapidly that the seedlings had to be weeded out very quickly. At least that was the Arab gardener's murmured excuse for their disappearance. It seems that some species of the herb grew wild in the compound, where anything would grow in the sandy soil if it were given enough water. My niece was not well enough acquainted with herbs to know whether the basil I sent her and the plant that stood four feet tall in untended corners of the walled yard were the same. The latter may have been a less fragrant variety—like the surprising *Ocimum carnosum* I grew this year that had no characteristic clove-like scent at all.

I want to include herbs which will remind the transplanted family of a New England herb garden; and on checking over those in the hospital bouquet, I was brought up short by the realization that sage, thyme, and chamomile will be going back to the scene of their origin. How tenderly these plants have been carried from civilization to civilization: by the Crusaders to England, by the Pilgrims to the New World; and now they will be journeying back again, not as outlandish plants but as heart-warming reminders of home. As a minority group in a non-Christian country, the American family celebrating Christmas in its home is rather like the early dissenters in the Puritan Colony of Massachusetts. The celebration of Christmas was forbidden by law in 1659 as a "festival superstitiously kept." Only the Church of England members are reported to have defied the law that ordered work as usual and forebearance of feasting or the like for twenty-two years. It was not until the nineteenth century that Christmas became a legal holiday in the United States.

Gardening in Arabia is limited to the water supply available, so I have planned the seed gift to furnish the most fragrance and flavor from the least amount of space. All the herbs must be sent or taken to the country as seeds. Some may be growing in fertile spots in other parts of the Middle East but for the project at hand there could be no hope of securing plants. My niece does not have even a nodding acquaintance with botany or horticulture; she must enter either field through the kitchen door.

In Saudi Arabia it would be possible to grow a mandrake to blooming size. In my garden the carrot-like roots of *Mandragora officinarum* sulk all summer with not a sign of green at the top. But who wants a magical mandrake in a kitchen garden? The young people have no need of a fertility charm. Some species of lavender are indigenous to Arabia, say the experts. It would be easy to grow the sweet-scented herb of the clothes-press there, but that can wait until the new herbalist is better acquainted with the savory culinary herbs. She will want marjoram to

transform the all too-familiar roast of lamb. *Origanum* species are found in Israel; there sweet marjoram will become an evergreen shrublet with its hop-like white flowers lasting over a long period.

Artemisias do grow around the ancient city of Bethlehem. *A. vulgaris* might be included, I judge, from reading *From Cedar to Hyssop* by Crowfoot and Baldensperger; it is a "study in the Folklore of Plants in Palestine," published in England in 1932. Species of *Anchusa,* cousin to borage, are listed in this book so a packet of borage, *Borago officinalis,* will be added. The blue star-shaped flowers will be a delight to the eye, and the tender young leaves will give a cool cucumber-like quality to salad if chopped fine. *Melissa officinalis,* or lemon-balm, is not described as native to the Middle East, but surely it would grow as well as the salvias which are quite numerous there. Perhaps I had better search for a copy of this out-of-print book to send with the seeds. If the gift seeds take root, my niece may be able to collect seeds of some of the herbs illustrated at the end of the book to send back to me. It is a lost year in the garden and greenhouse that does not see some hitherto unknown (to me) plant brought from seed to flowering.

Parsley can be grown in Saudi Arabia in the cool months so why not chervil? The lacy-leaved annual suffers from sun-burn in my garden, but under the shade of bushes or trees it might make a delicate groundcover and offer faintly tarragon-tasting leaves to chop over chicken. Summer savory also will give several cuttings in a few short months of the growing season to go with beans and chicken. Thyme would be no problem if rains did not wash out the fine seeds. It could be sown in the sandy soil and irrigated gently on either side of the row or watered with a fine spray. Water is carried in donkey carts in Saudi Arabia and thrown by bucket on the grass. One of the repeat-action sprayers with a hose to rest in a pail of water would be ideal in such a situation. The nozzle permits turning the spray to any degree of fine misting, and the brass tube that is pumped by hand will throw a stream thirty-five to forty feet. It has taken the place of the harder-to-clean tank sprayers in all operations on our place from spraying small fruit trees to watering seedlings in the greenhouse or feeding them with liquid plant food.

I may be too ambitious in imagining a garden to be grown in Saudi Arabia from a small gift of seeds. Other gardens, all planted for friends, have not proved the "open sesame" to the intriguing study of herbs that I had hoped they would. Yet this time it may be different. To raise plants from seed is as different from buying plants as bearing children is different from adopting them. The waiting seems to prepare one for the wonder of growth. The planted seed, even while in the ground, gives a sense of anticipation and excitement that the potted plant purchased or presented by another can never quite approach. Whether or not the young mother will find time to do the sowing and weeding herself, I hope she may know the pleasure that comes from handling fragrant plants. Working in the soil is a release from anxiety and loneliness unmatched by any other medium except perhaps by modeling in clay or painting. The more we are surrounded by manufactured things, or limited in movement, the more necessary such activity is in bringing peace to the spirit. I was surprised last winter to hear a young Chinese refugee student, about seventeen years old, speak of the exquisite gardens in his home village. He said with an ancient wisdom, "Women cannot go anywhere outside of the walls of their home village so they grow beautiful flowers and arrange them most artistically."

The scented leaf of sage held in a warm hand can carry one's spirit over a compound wall and across the ocean to the place where it was first encountered.

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LETTERS TO THE EDITOR

Willa Cather in her novel *Sapphire and the Slave Girl* (Book 2, Chapter 1) tells of an older man (Blake) without a family who takes a sick boy who has no family and nurses him back to health. She writes:

"Blake took me [the young boy] to his room, and he and the old Mexican women nursed me. He ought to have had boys of his own to look after. Nature's full of such substitutions, but they always seem to be sad, even in botany."

Can you tell me what substitutions in botany Miss Cather is referring to? I have found nothing that seems to fit this allusion. The closest I have come is the dodder, which plant Miss Cather would have known in Nebraska.

JOHN MARCH
Willa Cather Pioneer Memorial
New York, N. Y.

Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer, in answering our correspondent said in part:

I confess that the idea of a plant nursing a young and ailing plant back to health leaves me somewhat at a loss. And plants are the only subject of botany.

A plant doesn't even care for its own offspring, except for a little food provided as a starter.

Of course there are, as you suggest, parasites: dodder, mistletoe, and the whole army of parasitic fungi. But I don't see how their relations with their hosts could be spoken of as "substitutions."

It has been suggested, by another member of the Garden's staff, that a scion—a detached shoot capable of propagation by being grafted to another plant—may constitute a substitution in botany.

I have received a copy of the July-August 1960 issue of *The Garden Journal,* with its most interesting article on the Croton Point Underhills of whom I know considerable by first-hand knowledge and from my late father who visited his relatives there when he was a young man three-quarters of a century ago. I have in my possession my father's photograph of "Interwasser." My father always lamented the fact that Croton Point went out of the Underhill family, but he was pleased that Westchester County finally acquired the property for park purposes.

I know that Charles A. Underhill will want to make favorable comment on this article in the next issue of the semi-annual *Bulletin* of the Underhill Society.

DUDLEY FIELD UNDERHILL,
Mill Neck, Long Island

Mrs. John H. Ballantine, an Underhill descendant and member of our Society, has been good enough to send me the July-August 1960 issue of *The Garden Journal,* containing Dr. Edmund H. Fulling's article on "Yew Trees and Vineyards of Croton Point."

It is interesting to note that we published an article by Stephen Maurice Underhill, son of Stephen W., in the June 1960 *Bulletin,* of which I am enclosing copy. The copy I hold of *The Garden Journal* will go into the Underhill collection of the family.

CHARLES A. UNDERHILL, *President*
Underhill Society of America,
Greenwich, Connecticut

I have met many people who saw the article on "The Quaker Hill Museum of Natural History" in the July-August issue of *The Garden Journal,* and quite a few have come to see the Museum. This brings me to the reason for this letter.

The Quaker Hill Museum of Natural History moved to larger quarters not far from its present location the middle of September. The new quarters in the Aiken Free Public Library on Quaker Hill, Pawling, New York, provide more room to display the exhibits to better advantage.

To reach the Museum's new location, follow Route 22 north; turn right about twelve miles after leaving Brewster, at the first traffic light where there is a sign "Quaker Hill"; follow the paved winding road that ends at the top of the hill; turn right and go south for about half a mile. The Aiken Free Library is a large stone building on the left, at the intersection of four roads.

OLIVE M. GUNNISON
(*Mrs. Raymond M. Gunnison*)
Pawling, New York

You should know what delight "Echoes of the Past" has given me, as I knew the Brittons in the early days at The New York Botanical Garden—spent many hours in the laboratories and studied mosses with Mrs. Britton.

Several times Miss Delia W. Marble came to see Mrs. Britton. When in the early 1930s I was able to start a little garden club here in Somers, I was greatly encouraged by Miss Marble. She introduced me to Miss Luquer and others of the Bedford ladies who had done so much in public-spirited development of that lovely old town—the making of Pound Ridge Reservation, and so on. As we struggled to make our garden club more than a social gathering, Miss Marble and Miss Luquer came quite often to talk to us, showed the collection of lovely paintings by Miss Luquer, and helped in so many ways.

I just remember the Agassiz Club as a little girl and mostly recall the huge green caterpillars brought into the house by my brothers; but our dear Aunt Ruth took us on walks and always knew the name of everything we saw and made us love the countryside and gardening—most consoling to a city child.

So thank you for the "Echoes of the Past" and the other well-written, up-to-date articles in the September issue of *The Garden Journal.*

JULIA T. EMERSON
Somers, New York

Records of The New York Botanical Garden reveal that Miss Emerson, born on April 6, 1877, was graduated from the College of Pharmacy, Columbia University, in 1898; studied at Teachers College, Columbia, in 1898-1899; and also spent some time at the Marine Laboratory, Woods Hole, Massachusetts, in 1899, 1901, 1903, and 1904. While a student at Columbia University, Miss Emerson spent, as she stated, many hours at The New York Botanical Garden; and in 1903-1904 was a laboratory assistant at the Garden. Her specialty was the taxonomy of mosses, and she is author of a number of scientific publications. In 1913 she was co-author with Elizabeth Britton of "*Andreaeaceae*" in *North American Flora.* Another interesting contribution by Miss Emerson appeared in *Torreya* (1919) on "Botanical Observations in Iceland and Spitzenbergen."

BOOK REVIEWS

PLANT PROPAGATION. Hartmann, Hudson T. and Dale E. Kester. 559 pages, indexed, illustrated. Prentice-Hall, Inc., New York. 1959. $8.75.

Within the past five years six books on plant propagation have been published, and while all of them are good, this, in my opinion, is one of the best. Designed primarily as a college textbook, it therefore covers a wide range of subjects associated with plant propagation, but does not deal with any of them too exhaustively. One of its most valuable aspects is the extended list of supplementary reading and references given at the end of each chapter. This means that any serious student of plant propagation can widen his knowledge almost indefinitely by following up the references given. The book is clear, concise, up-to-date, and authoritative.

The only serious criticism that one could find is the use of colloquial rather than correct botanical names in describing plants. Surely a book aimed at the teaching of young plantsmen should rise above the colloquial level. If it is felt that these common names have to be mentioned, then the index is sufficient. This minor criticism does not detract from the true value of the book, and it is one which should be on the shelves of any keen horticulturist.

JAMES S. WELLS
Red Bank, New Jersey

THE GRAFTER'S HANDBOOK. Garner, R. J. 249 pages, indexed, illustrated. Oxford University Press, New York. 1959. $5.75.

Since its original publication, THE GRAFTER'S HANDBOOK has been the only authoritative and standard work dealing with this aspect of plant propagation. The revised edition simply maintains and further establishes this book as an integral part of any good horticultural library. While the text is largely built around Mr. Garner's work at the Experimental Station at East Malling, England, where fruit is his main interest, the techniques and methods described and illustrated with very clear line drawings are applicable to any type of horticultural plant for which grafting is necessary. This is an extremely valuable book.

JAMES S. WELLS
Red Bank, N. J.

ILLUSTRATED FLORA OF THE PACIFIC STATES, Volume IV. Abrams, Le Roy, and Roxana Stinchfield Ferris. 732 pages. Illustrated, indexed. Stanford University Press, Stanford, California. 1960. $17.50.

This volume, covering *Bignoniaceae* to *Compositae* in the Englerian sequence, brings to a close the four-volume *Illustrated Flora of the Pacific States.* As in each of the previous volumes, it includes the description,

(Continued on page 243)

BRIEF NOTES ON RECENT BOOKS

By Elizabeth C. Hall

Miss Hall is the Librarian of The New York Botanical Garden.

FLOWER ARRANGEMENT

DECORATING WITH SEED MOSAICS, CHIPPED GLASS, AND PLANT MATERIALS. Van Rensselaer, Eleanor. 214 pages, illustrated, part colored, bibliography, indexed. D. Van Nostrand Co., Princeton, N. J. 1960. $5.95.

Ideas galore abound in this new book by the author of *Decorating with Pods and Cones*. A generous list of sources of supplies is most helpful.

FLORAL DECORATIONS FOR YOUR CHURCH. Hunt, Fern Bowers. 223 pages, illustrated, part colored, glossary, bibliography, indexed. Chilton Co., Philadelphia, 1960. $6.95.

This excellent treatment of the subject includes chapters on symbolism of plant materials, the teaching of children, Christmas customs, decorations for special occasions, and the church garden.

JAPANESE FLOWER ARRANGEMENT; CLASSICAL AND MODERN. Sparnon, Norman J. 264 pages, illustrated, part colored, bibliography, glossary, indexed. Charles E. Tuttle Co., Rutland, Vt. 1960. $15.00.

The classical Ikenobo and the modern Sogetsu schools of Japanese floral art are described and illustrated. A particular feature is the appendix which includes the botanical as well as vernacular English and Japanese names of plants.

JAPANESE FLOWER ARRANGEMENT IN A NUTSHELL; A PRIMER. Allen, Ellen Gordon. 55 pages, illustrated, bibliography. Charles E. Tuttle Co., Rutland, Vt. 1959. $1.00.

Written for the beginner by an American who studied Ikebana while living in Japan.

THE FLOWER ARRANGEMENT CALENDAR: 1961. Wilson, Helen Van Pelt. Unpaged, illustrated. M. Barrows and Co., New York. 1960. $1.50.

A delightful engagement book with a picture of a new arrangement for each week of the year.

CHILDREN'S BOOKS

CREATURES OF THE NIGHT. Sterling, Dorothy. 125 pages, illustrated, part colored, bibliography, indexed. Doubleday and Co., Garden City, N. Y. 1960. $2.95.

An authoritatively written book to guide you into the world of beetles, katydids, moths, and crickets without leaving your doorstep. The illustrations by Winifred Lubell are really wonderfully done.

THE NATURAL HISTORY OF THE SOUTHWEST. Burns, William A., ed. 141 pages, illustrated, part colored, indexed. Franklin Watts, Inc., New York. 1960. $4.95.

A beautifully illustrated work written by members of the staff of the Arizona-Sonora Desert Museum under the direction of Dr. William A. Bruns of the American Museum of Natural History. Peggy Pickering Larson has given a fascinating description of the flora.

GREAT MYSTERIES OF THE EARTH. Hapgood, Charles H. 72 pages, illustrated. G. P. Putnam's Sons, New York. 1960. $2.75.

The what's, why's and how's of some of the earth's phenomena—earthquakes, drifting continents, the last great ice cap, volcanoes.

ROCKS AND THE WORLD AROUND YOU. Clemons, Elizabeth. 109 pages, illustrated, bibliography, indexed. Coward-McCann, Inc., New York. 1960. $3.50.

For the young collector and would-be collector of rocks and minerals. The illustrations would be far more helpful, if they were in color.

STATE TREES. Earle, Olive L. Unpaged, illustrated by the author. William Morrow and Co., New York, 1960. $2.50.

Companion volume to Miss Earle's *State Birds and Flowers*. The text is simply written. The illustrations of the trees and their leaves, flowers, and fruits are outstandingly lovely.

TIMBER: FARMING OUR FORESTS. Buehr, Walter. 96 pages, illustrated by the author, indexed. William Morrow and Co., New York. 1960. $2.75.

Although written for the 10-14-year age group, this is good informing reading for oldsters as well.

WONDERS AT YOUR FEET; A NEW WORLD FOR EXPLORERS. Cosgrove, Margaret. 64 pages, illustrated by the author, indexed. Dodd, Mead and Co., New York. 1960. $2.95.

Another of the fascinating "Wonders Book" series by the author of *Wonders of the Tree World, Wonders under a Microscope*, and others. This one has a charming chapter introducing algae, fungi, mosses, club mosses, lichens, horsetails, liverworts, and ferns to the young reader.

GARDENS, GARDEN PLANTS and LAWNS

GARDEN IDEAS AND PROJECTS; A HANDBOOK FOR HOME GARDENERS. Whittemore, Richard D., ed. 532 pages, illustrated. Doubleday and Co., Garden City, N. Y. 1959. $3.95.

A welcome return—much of the contents were previously published in booklets which went out-of-print. Among the vast number of subjects covered are: garden structures and equipment, special types of gardens, garden calendar for many different climatic regions and pronouncing dictionary of plant names.

A BIBLE GARDEN. Goldsmith, Margaret O. 16 pages, illustrated. Abingdon Press, New York. 1960. $.50.

Particular emphasis is given to Bible plants for indoor and terrace gardens with suggestions also of the more hardy kinds for out-of-doors. The list of sources for plants and containers is a bonanza.

BUDGET LANDSCAPING. Lees, Carlton B. 152 pages, illustrated, bibliography, indexed. Henry Holt and Co., New York. 1960. $3.95.

Chiefly a number of "case histories" of landscaping particular houses. Pleasant enough to read and helpful but not really very "meaty".

CACTI. Shurly, E. 160 pages, illustrated, part colored, indexed. Abelard-Schuman, Ltd., New York. 1960. $4.50.

An authoritative text on the growing of cacti in Great Britain with little emphasis on the botanical aspects of the group. Very nice colored and black and white illustrations.

CONTEMPORARY PERENNIALS. Cumming, Roderick W. and Lee, Robert E. 363 pages, illustrated, glossary, indexed. The Macmillan Co., New York. 1960. $6.95.

The proprietor of Bristol Nurseries and a well-known Cornell professor of floriculture have given the home gardener an up-to-date, knowledgeable, and practical guide to the growing of worthwhile perennials. The tabulation of blooming period, color, foliage, height, suitable location is good.

EASY WAYS TO A BEAUTIFUL GARDEN, Gannon, Ruth. 165 pages, illustrated, indexed. The Studio Publications, The Viking Press, New York. 1959. $5.00.

Simple planting diagrams, evaluations, and recommendations of specific varieties make this little book a useful aid for the beginning and almost-beginning gardener.

FRAGRANCE AND FLAVOUR; THE GROWING AND USE OF HERBS. Hemphill, Rosemary. 104 pages, illustrated. Charles T. Branford Co., Newton, Mass. 1960. $3.00.

Full of so many herby things—herb teas, aromatic baths, fragrant gift suggestions, and herb recipes. One chapter is devoted to the growing, harvesting, and using of twenty-five herbs, and there is a section for the indoor gardener.

HOW TO GROW ROSES; 2nd ed. Edwards, John Paul and Editorial Staffs of Sunset Magazine and Books. 88 pages, illustrated, part colored, indexed. Lane Book Co., Menlo Park, Cal. 1960. $1.75.

A very usable, comprehensive guide.

IRIS FOR EVERY GARDEN; rev. ed. Mitchell, Sydney. 216 pages, illustrated, part colored, bibliography, indexed. M. Barrows and Co., New York. 1960. $4.95.

The 1949 edition has been thoroughly revised and updated "with Boswellian fidelity" by Molly Price, an ardent admirer of the late Professor Mitchell, and herself well known in iris circles. There is a fine foreword written by F. W. Cassebeer, eminent breeder and grower of iris.

LAWNS FOR GARDEN AND PLAYING FIELD. Dawson, R. B. 176 pages, illustrated, glossary, indexed. Penguin Books, Baltimore, 1960. $1.45.

A good book for those it is designed to serve, but the making and maintenance of lawns in North America differs so much from the British procedures with which this text deals that the book is of limited use to Americans.

SUNSET LAWN AND GROUND COVER BOOK; 2nd ed. Sunset Magazine Staff. 95 pages, illustrated. Lane Book Co., Menlo Park, Cal. 1960. $1.75.

Text, photographs, diagrams, and tables—very well done.

THE JUDGING OF ROSES. Lewis, C. H. 89 pages, illustrated, indexed. American Rose Society, Columbus, Ohio. 1960. $3.00.

Adopted as the official judges' manual by the Board of Directors of the American Rose Society—no more need be said.

THE ROMANCE OF DAFFODILS. Brumbach, William C. 47 pages, Greenwich Book Publishers, New York. 1959. $2.00.

A very interesting, easily readable, and distinctly personal account of one man's horticultural hobby—the seeking of old-time narcissus varieties and of knowledge about them.

PLANTS AND ENVIRONMENT

PLANTS AND ENVIRONMENT; A TEXTBOOK OF PLANT AUTECOLOGY; 2nd ed. Daubenmire, R. F. 422 pages, illustrated, maps, bibliography, indexed. John Wiley and Sons, New York. 1959. $6.95.

A revised edition of the 1947 text. The extensive bibliography has been updated and expanded.

THE VEGETATION OF WISCONSIN; AN ORDINATION OF PLANT COMMUNITIES. Curtis, John T. 657 pages, illustrated, maps, tables, bibliography, indexed. University of Wisconsin Press, Madison. 1959. $7.50.

A detailed ecological survey of plant life in Wisconsin viewed historically and currently. Conservationists and students of plant ecology will find this a definitive work.

TREES AND FORESTRY

A POCKET GUIDE TO TREES. Platt, Rutherford. 256 pages, illustrated, indexed. Washington Sq. Press, New York. 1960. $.50.

Original title: *American Trees; a Book of Discovery*. Now in a handy size and still embellished with numerous line drawings and photographs of our trees, both native and introduced.

AN INTRODUCTION TO AMERICAN FORESTRY; 3rd ed. Allen, Shirley W. and Sharpe, Grant W. 466 pages, illustrated, maps, bibliographies, indexed. McGraw-Hill Book Co., New York. 1960. $7.95.

An up-to-date revision of the 1950 edition with many of the chapters rewritten and new illustrations added. The lists of American and Canadian forestry schools are most useful.

BONSAI; JAPANESE MINIATURE TREES; THEIR STYLE, CULTIVATION, AND TRAINING. Yashiroda, Kan. 166 pages, illustrated, indexed. Charles T. Branford Co., Newton, Mass. 1960. $5.75.

The author, a Japanese nurseryman, studied at Kew and at The Brooklyn Botanic Garden. He has produced an authoritative, comprehensive, and well illustrated book on the art of growing miniature trees. Bonsai culture of chrysanthemums in the cascade style is included in this excellent work.

DECORATIVE TREES AND SHRUBS. Schwarzenbach, Hans. 63 pages, 60 colored plates, indexed. A Studio Book, The Viking Press, New York. 1960. $20.00.

A beautiful work which includes plates in seven colors after the originals by Hans Schwarzenbach; a descriptive text by Hans Zaugg and Hans Coaz, translated and adapted by Herbert L. Edlin. According to the translator's preface, all the trees and shrubs depicted can be obtained from American nurserymen and are hardy in most parts of North America.

MUNICIPAL STREET TREES; A MANUAL FOR PUBLIC OFFICIALS AND MUNICIPAL FORESTERS. 58 pages, illustrated, bibliography. League of Wisconsin Municipalities, Madison. 1960. $3.00.

Exactly what its title and subtitle imply and, as such, useful and of interest to the group to whom it is addressed.

NATURE STUDY AND MISCELLANEOUS WRITINGS

DECORATIONS FOR CHRISTMAS. Ray, Grace Baker. Unpaged, illustrated. The author, 738 Sheridan Drive, Lancaster, Ohio. 1960. $2.00.

An accredited flower show judge offers over a hundred suggestions for Christmas. The uses of "simple, easy-to-get materials" from the garden, fields, and woods are emphasized.

GREAT AMERICAN RIVERS AT A GLANCE. Heath, Monroe. 35 pages, illustrated. (The Great American Series, vol. 8) Pacific Coast Publishers, Redwood City, Cal. 1960. $1.00.

Useful facts concerning thirty important rivers.

IN THE LAND OF THE QUETZAL FEATHER. Morton, Friedrich. 208 pages, illustrated, Devin-Adair Co., New York. 1960. $4.50.

A chatty account of life among the Indians of Guatemala by a coffee plantation manager. Brief mention is occasionally given of the flora and fauna.

JOURNEY INTO SUMMER; A NATURALIST'S RECORD OF A 19,000-MILE JOURNEY THROUGH THE NORTH AMERICAN SUMMER. Teale, Edwin Way. 366 pages, photographs by the author, indexed. Dodd, Mead and Co., New York. 1960. $5.95.

Another American season from Edwin Way Teale's pen and camera—this time it's summer in twenty-six states. Each page is filled with the keen observations of this gifted nature writer, who doesn't hesitate to fortify his own statements by calling to the attention of his readers the writings and teachings of other naturalists.

SACHETS AND DRY PERFUMES; a Practical Handbook for the Making of Sachets and Dry Perfumes at Home with Easily Obtained Materials, together wtih Much Curious History, Anecdote and Lore of Flowers, Herbs, Spices, and Fragrances. Karpilow, Shelley. 31 pages, illustrated. The Porpoise Bookshop, San Francisco. 1960. $.25.

This will interest the herb enthusiasts.

THE INCAS OF PEDRO DE CIEZA DE LEON. Von Hagen, Victor Wolfgang, ed. Translated by Harriet de Onis. 397 pages, illustrated, maps, bibliographical notes, indexed. Univ. of Oklahoma Press, Norman. 1959. $5.95.

Stimulating background reading for those seeking source material on Peruvian history and the way of life of the Incas.

THE NATURE PROGRAM AT CAMP; A BOOK FOR CAMP COUNSELORS. Nickelsburg, Janet. 137 pages, illustrated, bibliographies. Burgess Publishing Co., Minneapolis. 1960. $3.50.

This should be "required reading" for all nature counselors. It is rich in ideas, precautions, and sound advice. Its extensive list of books and bulletins on all phases of nature study and teaching is splendid.

BIOGRAPHY

ASA GRAY: 1810-1888. Dupree, A. Hunter. 505 pages, illustrated, bibliography, indexed. The Belknap Press of Harvard Univ. Press, Cambridge, Mass. 1959. $7.50.

Botany plays an important role in this scholarly biography, but there is much, much more. Asa Gray, a staunch supporter of Darwin, lived in an exciting era, and his life is here described with a vivid national and international background.

DANCE OF THE TREES (The Adventures of a Forester); with a foreword by Sir Arthur Bryant. Baker, Richard St. Barbe. 192 pages, illustrated. Wellington Books, Belmont, Mass. 1960. $3.50.

The founder of the Society of The Men of the Trees, internationally known for his numerous conservation projects, tells of his adventurous life among the trees and forests of many lands.

OF NATURE, TIME AND TEALE; A BIOGRAPHICAL SKETCH OF EDWIN WAY TEALE. Dodd, Edward H., Jr. 63 pages, illustrated. Dodd, Mead and Co., New York. 1960. $3.00.

A gem of a book, with pleasing typography and physical make-up. Mr. Dodd, a skilled writer, has made a delightful contribution.

DIRECTORIES, DICTIONARIES, HANDBOOKS

A PICTORIAL GUIDE TO AMERICAN GARDENS. Frohman, Louis H. and Elliot, Jean. 368 pages, illustrated, part colored, indexed. Crown Publishers, New York. 1960. $5.95.

A generously illustrated directory of fifteen hundred gardens, public and private, in the United States, including Alaska and Hawaii. Most helpful information is given about location, hours, and seasons for public inspection, and entrance fees. The index to flowers, trees, and shrubs is especially useful.

DICTIONARY OF ECONOMIC PLANTS. Uphof, J. C. Th. 400 pages, bibliography. Hafner Publishing Co., New York. 1959. $9.75.

Over six thousand species of plants useful to man are dealt with. Brief descriptions, with notes on geographical distribution, products, and uses are given. Cross references from vernacular to botanical names and an extensive bibliography arranged by subjects are important features.

HANDBOOK FOR GARDEN CLUBS. 89 pages, indexed. The Ohio Association of Garden Clubs, Inc., Victor H. Ries, Secretary, 1241 Lincoln Road, Columbus 12, Ohio. $1.50.

Congratulations to the contributors to this booklet which offers many ideas and much information.

THE GARDENER'S DIRECTORY. Stephenson, J. W. 454 pages, bibliography. Hanover House, Garden City, N. Y. 1960. $3.95.

A most comprehensive and accurate compilation of information about horticultural organizations, places of horticultural interest (including a guide for travelers), sources for plants and seeds, lists of books and periodicals, libraries, calendar of horticultural events. Very well done.

BOOKS FOR CHRISTMAS

Books are a happy choice for Christmas gifts—a reminder of your thoughtfulness the year round.

Books reviewed in the pages of *The Garden Journal*, or any book on botany, gardening, flower arrangement, natural science, or kindred subjects may be ordered through Book Service.

Members are entitled to a ten per cent discount on the list price. Please send check or money order payable to The New York Botanical Garden with your order.

NEWS, NOTES and COMMENTS

Activities of the Director and Staff. Within the past several months, Dr. William C. Steere, Director, attended the annual meeting and dinner of the American Association of Botanic Gardens and Arboreta in Boston; meetings in Washington, D. C., of the National Research Council and of a panel of the National Science Foundation; the dedication of the Climatron at the Missouri Botanical Garden in St. Louis. He gave the address as retiring president of the Botanical Society of America on "Botanical Problems in Arctic America;" presented a paper on "Ten Years of Progress in Bryological Work in the Arctic" before the American Bryological Society; presented a paper before the Teaching Section of the Botanical Society of America, on "The Botanical Garden as an Outdoor Laboratory for Taxonomy" in the symposium entitled "The Botanical Garden as an Outdoor Laboratory for Teaching."

Dr. Steere is co-editor with Dr. Willis H. Johnson of a book on biology for advanced high school and undergraduate college students, to be published by Henry Holt and Company.

T. H. Everett, Assistant Director (Horticulture) and Curator of Education, recorded three radio interviews for broadcasting on Ruth Alampi's Saturday morning program on WNYC.

Dr. H. W. Rickett, Acting Assistant Director (Botany) and Bibliographer, spent several days in Cambridge, Massachusetts, using the facilities of the modern air-conditioned library of the Gray Herbarium and Arnold Arboretum. Dr. Rickett recently completed editing two issues of *Memoirs of The New York Botanical Garden.* The first, consisting of the thesis "A Revision of *Spathiphyllum* (*Araceae*)" by George S Bunting, prepared for his doctorate, is now in proof; the second issue, devoted to "Botany of the Guayana Highlands," Part IV, cont., by Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Research, is in the hands of the printers.

Dr. Arthur Cronquist, Curator, is spending a month in Costa Rica under a grant from George R. Cooley of Chinsegut Hill, Florida. Dr. Cronquist's trip to Costa Rica is for the purpose of getting a first-hand look at tropical vegetation and the living representatives of a number of plant families that are confined to the tropics. He chose Costa Rica because it provides a combination of variety and accessibility. To quote Dr. Cronquist, "I am not trying to turn myself into a tropical botanist, but I do want to pay some attention to a heretofore neglected field of my botanical education."

Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, has been appointed Editor-in-Chief of *Mycologia* by the Council of the Mycological Society of America effective immediately.

Mary Fleming, Technical Assistant in the Cryptogamic Herbarium, collected a number of specimens on her recent trip to Trinidad for Dr. Rogerson and Dr. Maguire.

Dr. David J. Rogers, Curator of Economic Botany, has received a grant of $14,200 from the National Science Foundation for the systematic investigation of *Manihot esculenta* and related species. The grant is for three years. Dr. Rogers attended the meeting in Washington, D. C., of the National Research Council about processing biological data with electronic machines and the meeting in New York City of the Society for Economic Botany.

Dr. Richard M. Klein, Alfred H. Caspary Curator, was elected representative of the Development Section of the Botanical Society of America on the editorial Board of the *American Journal of Botany.* He attended the meeting in New York City of the Council of the Society for Economic Botany and spent five days at the Oak Ridge Institute for Nuclear Studies where he and Mrs. Klein gave a seminar on "The Interaction of X-rays and red and far-red light on growth and mutation of *Neurospora.*" Mrs. Klein is an instructor in microbiology at the Albert Einstein College of Medicine of Yeshiva University.

Dr. Elsa H. J. O'Donnell-Alveda, who is a visiting investigator in the Research-Laboratory under a grant from the Damon Runyon Fund, attended the International Cell Biology Conference in Paris this summer.

Dr. Mariafranca Carpaneda Morselli, a volunteer research assistant in the Research Laboratory, is working with Dr. Klein and Dr. O'Donnell-Alveda in physiological cytology. Dr. Morselli received gymnasium and lyceum diplomas from the Giovanni Parini Lyceum in Milan, Italy in 1941; Ph.D. in botany and natural sciences from the University of Milan in 1946. Dr. Morselli spent two years reading general sciences and mathematics at the Professional School in Milan. She taught botany, zoology, and economic botany at Quincy College in Quincy, Illinois, while at the same time she carried on research on *Chlorella vulgaris* under the supervision of the Botany Department of Northwestern University.

Dr. P. P. Pirone, Plant Pathologist, attended the Nassau County Turf Demonstration at East Meadows, Long Island.

Dr. Herman L. Becker, Visiting Research Associate, has received a grant of $40,000 for continued research in the Tertiary Ruby Flora of Montana with emphasis on the new assemblage called the York Ranch Flora. The grant is for three years. Through field work in Montana during 1959, sponsored by the National Science Foundation, a new floral assemblage of late Middle Eocene age was expanded, studied, described, and published by Dr. Becker under the title "The Mormon Creek Flora from the Upper Ruby River Basin in Southwestern Montana" in *Palaeontographica* B, 107, No. 4-6, pp. 83–126, pls. 18–35, August 1960. Mr. Becker has also had published "The Ruby Flora of Southwestern Montana" by the Billings Geological Society, *Guide Book 1960,* for the West Yellowstone Earthquake Field Conference, September 7–10, 1960. On the press are "Additions to the Ruby Paper Shale Flora of Southwestern Montana," *Bulletin of The Torrey Botanical Club,* September-October 1960, and "The Oligocene Ruby Paper Shale Flora of Southwestern Montana," Geological Society of America, *Memoir,* November 1960. This work was partially facilitated by a grant for the summer of 1957 by the Geological Society of America. When abroad this summer, Dr. Becker presented a paper on "The State of American Palaeobotany with Special Reference to Climate Interpretation" by invitation of the Hebrew University at Jerusalem, Israel, and a paper on "New Species from the Oligocene Ruby Flora of Southwestern Montana" at the twenty-first International Geological Congress in Copenhagen, Denmark.

Dorothy Ebel Hansell, Editor of *The Garden Journal,* attended the opening of *Flower Grower's* exhibition of photographs by Samuel H. Gottscho and members of the magazine's staff held in Grand Central Terminal, New York City, under the sponsorship of Eastman Kodak Company; the luncheon at the Tavern on the Green, Central Park, New York City, when Virginia Metalcrafters introduced a new garden tractor; the fiftieth anniversary of the National Association of Gardeners held in Asbury Park, New Jersey; visited Sterling Forest Gardens, Tuxedo, New York, to view the display of twelve thousand chrysanthemum plants and the orchid show in the International Pavilion arranged by the East-

Dr. David Rogers, Curator of Economic Botany (left) and Dr. Harold W. Rickett, Acting Assistant Director (Botany) and Bibliographer (right) entertain Dr. G. Edward Nicholson, Project Officer, Research and Agricultural Section, Special Funds, U. N. (second from left) and Sir Joseph Hutchinson, F. R. S., Draper Professor of Agriculture, University of Cambridge, and Special Consultant to the U. N., at the Snuff Mill in The New York Botanical Garden.

Dr. Clark T. Rogerson, Curator of the Cryptogamic Herbarium, supervised the students as they studied fungi.

ern Orchid Growers. Mrs. Hansell was a judge at the flower shows of Grange 141 in Millington, New Jersey, and of the Royal-Globe Insurance Group in New York City, and the show of the American Dahlia Society and the New Jersey Dahlia Society in Paramus, New Jersey.

Three graduate students came to the Garden in September 1960. Moneta Engvall who received B.A. in anthropology from Washington State University, and Gary C. Irvine, who received M.A. in botany from Syracuse University, are graduate assistants in the Herbarium; Fred Hille, who received M.A. in botany from the University of Kentucky, is research assistant to Dr. Cronquist under the latter's grant from the National Science Foundation.

1960 Summer High School Institute. Parents of participants in the 1960 Summer Institute for High School Students are most appreciative of the unique privilege their sons and daughters enjoyed. The five weeks at the Garden enlarged their vision of the opportunities open in botanical and horticultural pursuits. More than one parent said that he had been infected by his son's or daughter's enthusiasm and that he had caught a glimpse of the wonders of plant life.

One of the students has applied for a 1961 scholarship to the Roscoe B. Jackson Memorial Library at Bar Harbor, Maine; another is going to study genetics, another marine biology, and a fourth biochemistry. Several of the students have horticultural backgrounds. One is the granddaughter of a retail florist, and her uncles are engaged in landscape contracting. Another is the granddaughter of the late P. M. Koster, well-known plantsman of Bridgeton, New Jersey, and of Bagatelle Nurseries, Huntington, Long Island.

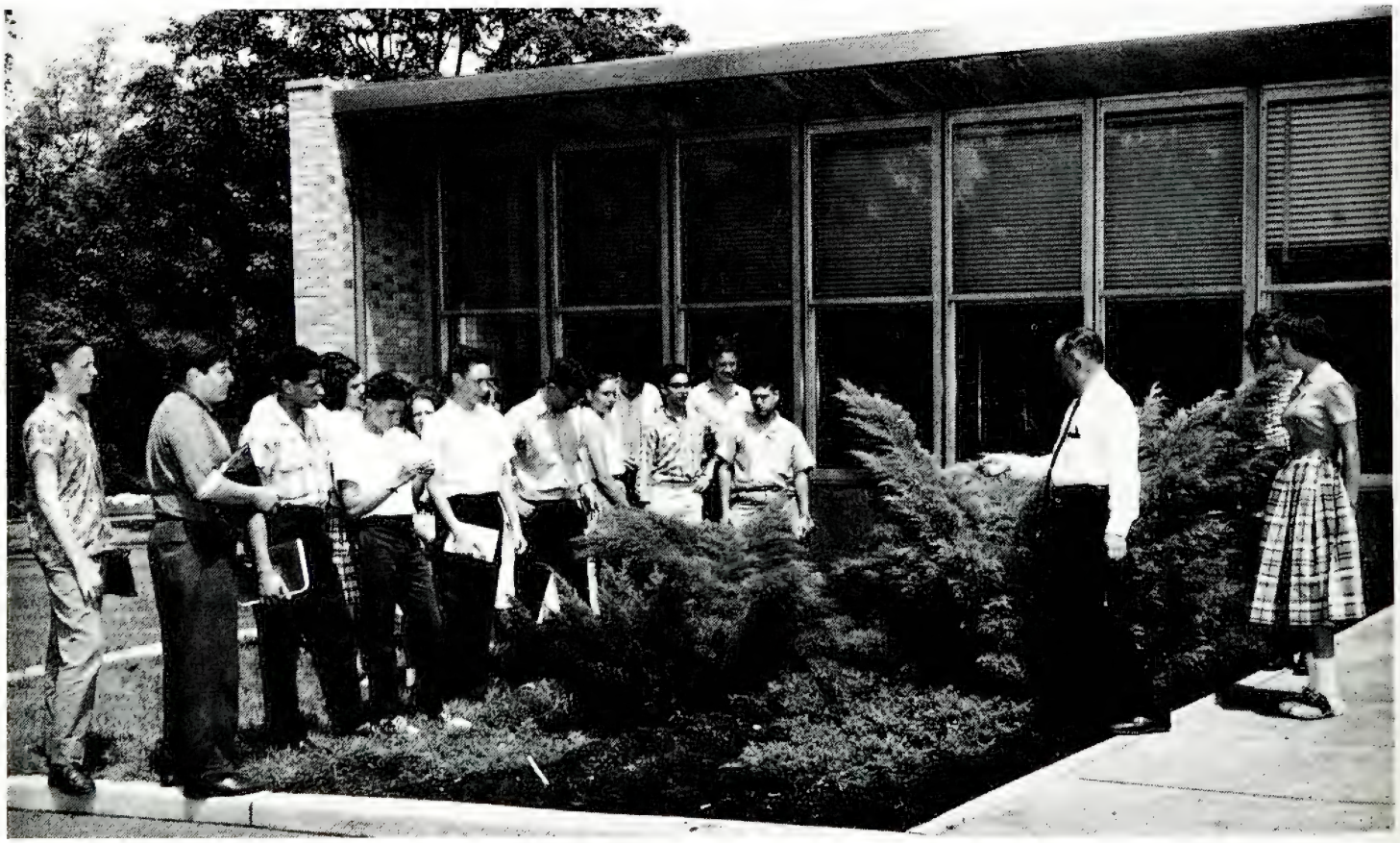
The students were tendered a luncheon at the Snuff Mill at the close of the Institute on August 12, 1960. A number of the parents were present. Dr. Cronquist, who directed the Institute, extended greetings for Dr. William C. Steere, Director of The New York Botanical Garden. Dr. Steere, who returned from Alaska on August 10, was called to Washington. Dr. Cronquist introduced George Schwartz, who assisted in directing the Institute, and members of the Garden's staff who instructed. Mr. Schwartz is a biology teacher at Forest Hills High School, New York.

After Mr. Schwartz presented the Certificates of Participation to the students, Walter Westman, on their behalf, presented a copy of *Light and Plant Growth* by R. Van Der Veen and G. Meijer to the Library of The New York Botanical Garden. He said: "We present to you this gift, really only a very small part of our appreciation of the efforts of all those connected with the Summer Institute and the Garden's staff. We wished to contribute something which could be of use to all those at the Botanical Garden and to future students here. I present this to you, as an addition to The New York Botanical Garden library, with great happiness, on behalf of the students of the 1960 Summer Institute."

The book is inscribed: "This volume was presented to the Library of The New York Botanical Garden by the students of the 1960 Summer Institute with sincere appreciation of the dedicated efforts of the staff."

Dr. Richard M. Klein, Albert H. Caspary Curator, showed the students protoplasmic streaming in *Elodea*.

Dr. P. P. Pirone, Plant Pathologist, explained to some of the students the pests that attack junipers.



Visitors to the Garden. Within recent months the following have visited The New York Botanical Garden:

Dr. Germain van Schoor, University of Brussels, Brussels, Belgium.

Dr. A. Tyznik, Morton Arboretum, Lisle, Ill.

Dr. Louis Nickell, Chas. Pfizer and Co., Chester, Conn.

R. Henry Norweb, Jr., The Holden Arboretum, Cleveland, O.

Dr. Allan Karn, International Business Machines Co., San Jose, Cal.

Dr. Soetomo Soerohalchko, Botanic Gardens, Bogar, Indonesia.

Mervin Oakes, Biology Dept., Queens College, Flushing, L. I.

T. A. Nosworthy, President, Bronx Savings Bank, New York, N. Y.

Carlo Paterno, New York, N. Y.

Mr. and Mrs. Gordon Foster, Bell Laboratories, Murray Hill, New Jersey.

Dr. Fred J. Seaver, Curator Emeritus, The New York Botanical Garden, Winter Park, Fla.

Prof. André Aubreville, Director, Phanerogamic Laboratory, Museum of Natural History, Paris, France.

Dr. Norman W. Pirie, Director, Rothamsted Experimental Station, Harpenden, Herts, England.

Dr. Tobías Lasser, Instituto Botánico, Caracas, Venezuela.

Dr. Leslie R. Holdridge, San José, Costa Rica.

Dr. Frank Kern, Dean Emeritus of the Graduate School of Penn State University and formerly Chairman of the Department of Botany, University Park, Pa. While Dr. Kern was at Columbia University in the early years of the present century, he did research at the Garden. A world authority on the cedar-apple rust, he is now engaged in a revision of his monograph on *Gymnosporangium* that was originally published in 1911.

Gifts to Library. Colleagues of the late Paul Hoffman, Editor of *Suburbia Today,* contributed one hundred and twenty-five dollars for the purchase of books for the Library of The New York Botanical Garden in his memory.

Melville C. Grosz presented files of *The National* (now *The American*) *Horticultural Magazine, Flower Grower, Popular Gardening, Horticulture, The Farm, New York State Conservationist,* and *Vermont Life;* and Dr. Caroline K. Allen complete volumes of the *National Geographic* from 1927 to date.

Postcards of Scenes at The New York Botanical Garden. A set of postcards—of the Museum and Administration Building with Japanese weeping cherry in bloom; the water-lily pool in the Conservatory courtyard; the chrysanthemum garden; and colorful fall foliage—will be sent upon request to members of the Garden who furnish a stamped self-addressed envelope.

R. Gordon Wasson, Vice President of The Morgan Guaranty Trust Co. of New York and Treasurer of The New York Botanical Garden, delivered the annual invitational lecture of the Mycological Society of America on "The Hallucinogenic Fungi of Mexico; an inquiry into the origins of the religious idea among primitive people," in Stillwater, Oklahoma, on August 30, 1960.

Dr. Arthur Cronquist, Curator, directed the 1960 Summer Institute for High School Students at The New York Botanical Garden.

The Torrey Botanical Club opened its fall-winter 1960-1961 season on October 8, 1960, with a field trip in the afternoon to The Brooklyn Botanic Garden to see the autumn flora, with G. Kalmbacher as leader, and a summer experience meeting after an informal buffet. Dr. Annette Hervey was in charge of arrangements and presided at the meeting.

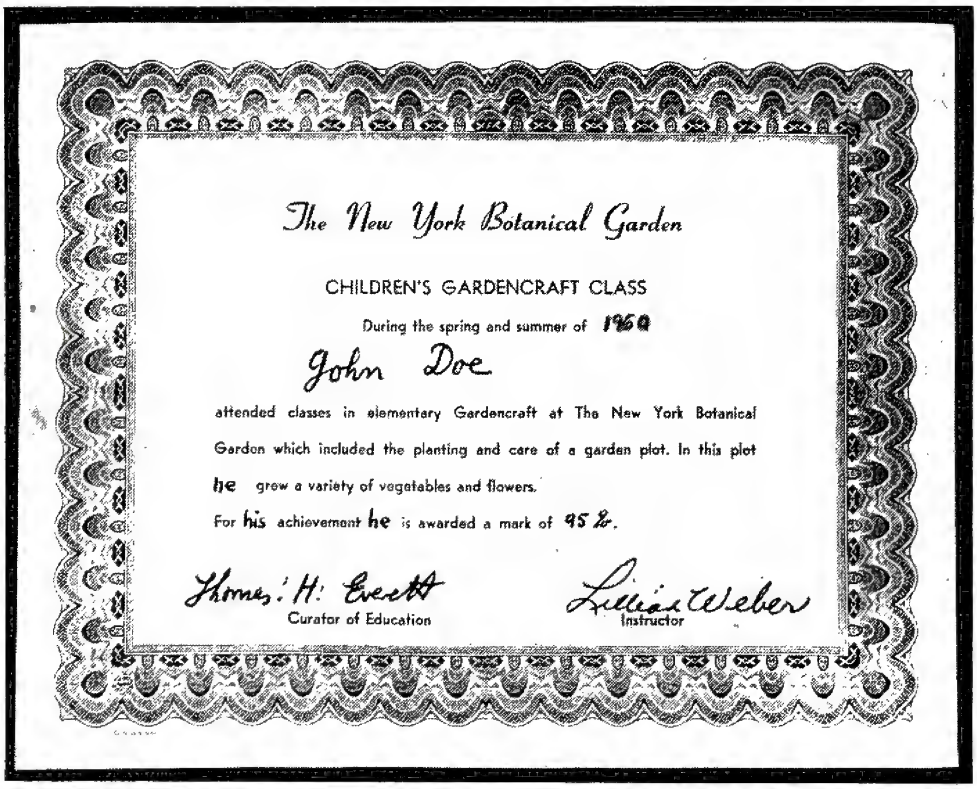
On October 25, 1960, a special program in honor of the late Dr. Bernard O. Dodge, Plant Pathologist Emeritus of The New York Botanical Garden, was held in Philosophy Hall, Columbia University. The significance of Dr. Dodge's work for plant pathology was discussed by Dr. P. P. Pirone, Plant Pathologist at The New York Botanical Garden; for mycological genetics by Dr. Olive Lindsay, Professor of Botany, and Dr. Francis J. Ryan, Professor of Zoology, both of Columbia University; for biochemical genetics by Dr. Edward L. Tatum, Professor at Rockefeller Institute for Medical Research. Dr. William J. Robbins, Director Emeritus of The New York Botanical Garden, was chairman of the meeting.

On November 1, 1960, in Schermerhorn Hall Extension at Columbia University, Dr. Richard Goodwin of the Department of Botany of Connecticut College, gave a talk on "Natural Areas, Their Preservation and Use."

On November 15, 1960, in Larkin Hall, Fordham University, Dr. Charlotte Avers of Rutgers University will discuss "Histochemical Localization of Enzyme Activities in Living Cells."

High school students studied microorganisms in the Research Laboratory under Dr. Annette Hervey, Research Associate.

Mrs. Lillian Weber, Instructor, inspected the plot of one of the Gardencrafters, while John Dowling assisted another Gardencrafter in weeding.



The New York Botanical Garden

CHILDREN'S GARDENCRAFT CLASS

During the spring and summer of 1960

John Doe

attended classes in elementary Gardencraft at The New York Botanical Garden which included the planting and care of a garden plot. In this plot he grew a variety of vegetables and flowers.

For his achievement he is awarded a mark of 95 %.

Thomas H. Everett
Curator of Education

Lillian Weber
Instructor

Some of the one hundred plots which were cultivated by Gardencrafters at The New York Botanical Garden during the summer of 1960.

Graduation of 1960 Gardencrafters. Eighty-five of the one hundred children who were instructed in practical gardening from March 25 through late August and tended plots—each child had his own plot—received certificates at exercises held on August 27, 1960. In addition, first prizes were awarded in the beginners' group to John Dzurich for the boys and to Marilyn Maiberger for the girls; in the advanced group first prizes were awarded to Kenneth Foley for the boys and to Louise Park for the girls. This is the fourth year that Louise has participated in the Gardencraft classes, and she has been a prize-winner each time.

Mrs. Lillian Weber, one of the instructors, acted as "mistress of ceremonies." Miss Nancy Callaghan, another instructor, showed colored slides of and spoke on the season's work and accomplishments. John Dowling, who also assists in the Gardencraft program, called the roll as Mrs. William C. Steere presented the certificates in the presence of some two hundred parents and friends.

Special Symposium will be sponsored by The Torrey Botanical Club, in conjunction with the meetings of the American Association for the Advancement of Science to be held in New York City this December.

The symposium on "Fundamental Developments in Plant Growth" will be held at the Hotel Biltmore, December 27, 1960. Dr. Annette Hervey, Research Associate at The New York Botanical Garden, has arranged an excellent all-day program in which the following will participate: in the morning, Dr. Daniel Arnon of the University of California on "Changing Concepts of Photosynthesis," Dr. John Mitchell of the U. S. Department of Agriculture on "Fundamental Developments in the Field of Plant Growth Regulators," Dr. N. Edward Tolbert of Michigan State University on "Alteration of Plant Growth by Chemicals," and Dr. Seymour H. Hutner of Haskins Laboratories on "'Plant-Animals' as Experimental Tools for Growth Studies"; in the afternoon, Dr. Harry A. Borthwick of the U. S. Department of Agriculture on "The Photoperiodic Control of Flowering," Dr. William S. Hillman of Yale University on "Test Tube Studies on Flowering," Dr. Thomas H. Jukes of the American Cyanamid Co. on "Relation of Antimetabolites to Plant Growth," Dr. Walter Tulecke of Boyce Thompson Institute for Plant Research on "Recent Progress and the Goals of Plant Tissue Culture." Dr. Paul Burkholder, Director of Research of Kitchawan Laboratories of The Brooklyn Botanic Garden, will be chairman of the morning session; Dr. George McNew, Managing Director of the Boyce Thompson Institute for Plant Reearch, will be chairman of the afternoon session.

At the luncheon, Dr. Charles Berger, Chairman of the Department of Biology of Fordham University, and Dr. William C. Steere, Director of The New York Botanical Garden, will speak informally to members and guests as President and Vice President, respectively, of The Torrey Botanical Club.

International Rhododendron Conference, under the auspices of the American Rhododendron Society, will be held in Portland, Oregon, May 12-14, 1961. Speakers from abroad include: Dr. H. R. Fletcher, Regius Keeper of the Royal Botanic Garden, Edinburgh; Dr. F. P. Knight, Director of

the Royal Horticulture Society Gardens, Wisley; Sir Giles Loder, official representative of the Royal Horticultural Society; H. J. Grootendoorst, Boskoop, Holland; Dietrich Hobbie, Germany; and Dr. J. S. Yeates of Massey College, New Zealand. Speakers from Pennsylvania, New Jersey, Maine, Ohio, Washington, D. C., and the three Pacific Coast states will present the latest ideas on culture, breeding, and new varieties in the different sections of the United States. The National Test Garden of the American Rhododendron Society is at its best on these dates, and the rhododendron show that is held annually in the Test Garden is scheduled to coincide with the conference. Information on tours, registration, and hotel accommodations may be had from Mrs. Ruth M. Hansen, 3514 N. Russet Street, Portland 17, Oregon.

The National Association of Gardeners, whose membership is composed of professional gardeners from private estates, botanical gardens, arboretums, horticultural foundations, and cemeteries, celebrated its fiftieth anniversary in a three-day conference at Asbury Park, New Jersey, September 13-15, 1960. Among the speakers were Ralph S. Bailey, Garden Editor of *House and Garden;* Ray E. Harmon, former Essex County (New Jersey) Agricultural Agent; Percy Adams, Superintendent of the Lessing J. Rosenwald Estate in Jenkintown, Pennsylvania; Miss Gena Thames of the Home Economics Department of Rutgers University; and Miss Michiki Tataki of Japan, now a scholarship student at Columbia University.

The Association was the original sponsor of the International Peace Garden that is located on the American-Canadian border between North Dakota and Manitoba and is now part of the National Parks System.

Donald Richardson of West Orange, New Jersey, horticulturist and well-known orchid grower, was succeeded in the office of president by Benjamin Crowther of New Hyde Park, Long Island.

Panzer-T70 "Compactor", a tractor for garden and farm, was introduced late this past summer by Panzer Products, Inc., of Waynesboro, Virginia. This is a division of the Virginia Metalcrafters, Inc., who have been makers of quality-metal products since 1890 and are known for their beautiful Colonial Williamsburg reproductions. The Panzer division moved from Laurel, Maryland, to Waynesboro in July of this year; it has its own foundries which produce everything for the tractor from raw materials, except the motor and tires.

This new Panzer-T70 "Compactor" was developed after a survey had been conducted among more than one thousand owners of Panzer tractors to learn what improvements they would like in future models. Optional equipment includes a motorized rotary tiller, power-driven saw, double-thickness rotary blade tips for longer wear in mowing grass, and redesigned blade for ease of handling in bulldozing and snow removal.

The Smithsonian Institution has been asked to consider reprinting Standley's *Trees and Shrubs of Mexico* (Contr. U. S. Nat. Herb., Vol. 23, Parts 1-5, pp 1-1712) which has been out of print for years. The Institution would welcome expressions of interest in such a reprint, the cost of which would be approximately $20. Address Editorial and Publications Division, Smithsonian Institution, Washington 25, D. C.

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J. W. Johnston, Garden Editor of the *New York Herald-Tribune* for nearly thirty years, has been honored by the Associated Bulb Growers of Holland. Mrs. Ogden Reid, representatives of the Herald-Tribune, the horticultural press, and horticultural organizations witnessed the presentation at the Hotel Biltmore, New York City, on September 28, 1960, of the eleven-inch-high sterling silver reproduction of a tulip in full bloom. It is mounted on a pedestal.

Bram Warnaar, Chairman of the Associated Bulb Growers of Holland, who presented the beautiful trophy to Mr. Johnston, cited Mr. Johnston's continual efforts to make America aware of the beauty of flowers. Before Mr. Johnston joined the Herald-Tribune, to conduct its "Yard and Garden Competition" in 1931, he ran a similar contest for *The New York World.* During World War II he conducted the "Victory Garden Harvest" which contributed $300,000 to Army and Navy Relief.

During his long and active career, Mr. Johnston has won more than sixteen hundred awards. Among those he values most highly is the Senator Aiken Capper Award that he received for a mixed bouquet of flowers at the flower show in San Leandro, California, in 1929. He picked the flowers from his little backyard garden in southern New Jersey and shipped them to California in dry ice. Mr. Johnston also prizes the gold medal and $1,000 award from the International Flower Show for "educational-excellence in interpreting flower shows to the American public."

BOOK REVIEWS (from page 236)

synonomy, distributional data, and a line drawing for each species within the range, and keys for determination. In addition, Volume IV contains the general key to families and indices to common and to Latin names for all four volumes. Volume IV was written by Mrs. Ferris with the assistance of specialists in various groups.

THEODORE M. BARKLEY
Occidental College
Los Angeles, Calif.

THE LEGUMES OF TEXAS. Turner, B. L. 284 pages, illustrated, indexed, distribution maps. University of Texas Press, Austin, Texas. 1960. $6.00.

This is a floristic treatment of the native and introduced legumes of Texas. It treats a total of 391 taxa, and it includes keys, synonomy, distribution maps, chromosome numbers where known, and considerable ecological and phenological data. In addition, the agricultural potentials of several taxa are pointed out.

THEODORE M. BARKLEY
Occidental College
Los Angeles, Calif.

THE GARDEN FLOWERS OF CHINA. Hui-Lin Li. Ronald Press Company, New York. 1959. $6.50.

Dr. Li traces the origin of the most important plants which have decorated the gardens of the Orient for centuries and in more recent years have added their beauty and usefulness to the gardens of the Western World.

After devoting the first chapter to "China, Mother of Gardens," and the second chapter to "A Historical Sketch of Chinese Horti-

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cultural Literature," Dr. Li treats such plants as the tree peony, chrysanthemum, narcissus, jasmine, in separate chapters, revealing historical and botanical information and the symbolic significance of the particular plant under discussion. He brings the reader up-to-date in the chapter "Recent Introductions in the Garden" and pays tribute to the many men from Father Armand David down through Wilson, Purdom, and Meyer who have enriched horticulture through their plant collections.

The book is written delightfully and attractively illustrated with line drawings and well reproduced plates. D.E.H.

PHYSIOLOGY OF TREES. Kramer, Paul J. and Theodore T. Kozlowski. xiii + 642 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1960. $12.50.

In a continuation of McGraw-Hill's notable series of publications in the botanical sciences, Professors Kramer and Kozlowski have compiled the first text in English on the physiology of trees. The sixteen chapters comprehensively cover growth, reproduction, photosynthesis, and metabolism and present outstanding syntheses of the water relations of trees. This book will undoubtedly be in use by forestry students, botanists, and horticulturists for many years.

RICHARD M. KLEIN

RADIATION, GENES, AND MAN. Wallace, Bruce and Th. Dobzhansky. viii + 205 pages. Illustrated, indexed. Henry Holt and Co., New York. 1959. $3.50.

Two distinguished scientists have written a clear, precise book on the problems facing all of us in this nuclear age. They analyze in unambiguous terms the hazards and problems which man must face in his exploitation of atomic energy for war and peace.

This book should be required reading for all who are concerned with the genetic future of our species.

RICHARD M. KLEIN

MICROBIAL VARIATION. Timakov, V. D. (Ed. by). 202 pages—illustrated, indexed. Pergamon Press, New York. 1959. $6.50.

This volume contains an English translation of reports in Russian of research carried out at the Gamaleia Institute of Epidemiology and Microbiology, the purpose of which was to find out whether variation in microorganisms could be so directed as to obtain virulent strains of pathogenic bacteria having immunizing ability.

ALMA W. BARKSDALE

INDEX MUSCORUM—VOL. I (A-C). Van der Wijk, R. (Chief Editor), W. D. Margadant and P. A. Florschütz. xxviii, 548 pages, indexed. The International Bureau for Plant Taxonomy and Nomenclature, Utrecht, Netherlands. $15.00 ($8.00 to members of Int. Assn. for Plant Taxonomy) 1959.

This is the first of five volumes that eventually will list all published names of the mosses of the world. More than thirty-five years have elapsed since the appearance of the last index to mosses, so that this monumental work, scheduled to appear at the rate of one volume a year, will greatly facilitate the work of all botanists engaged in the study of mosses or who must deal, in their curatorial or editorial duties, with the names of mosses. Grants of funds by the National Science Foundation to aid in the preparation and publication of this reference work reflect the international aspect of our urgent need for it.

WILLIAM C. STEERE

THE BIOLOGY OF MYCORRHIZA. J. L. Harley. 233 pages, illustrated, indexed. Interscience Publishers, Inc., New York. 1959. $8.75.

Dr. Harley uses the word "mycorrhiza" for the wide range of structures composed of fungal hyphae and the roots, rhizomes or thalli of other plants. The subject is presented in a form to interest biologists who are experimentally inclined. The first part deals with the general considerations of the associations of fungi with roots; the second part considers the ectotrophic mycorrhizas of forest trees including morphology, physiology, and ecology; the third part deals with the endotrophic mycorrhizas of ericaceous plants, orchids, mosses, etc.

CLARK T. ROGERSON

MUSHROOMS OF THE GREAT SMOKIES. L. R. Hesler. 289 pages, illustrated, indexed. University of Tennessee Press, Knoxville, Tenn. 1960. $5.50.

This is a field guide to some 193 mushrooms and their relatives which occur in the Great Smoky Mountain National Park. It is written for the amateur. The excellent black and white photographs, the keys, and the brief descriptions provide the means for identification. Most of the species included occur throughout eastern United States; hence the handbook will be useful in other areas.

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FIFTY YEARS OF CITRUS. The Florida Citrus Exchange—1909-1959. James T. Hopkins. University of Florida Press, Gainesville, Fla. x + 279 pages, indexed. 1960. $5.00.

The book is a detailed history of the people and activities of the Florida Citrus Exchange and the effect of this organization on the citrus industry. For one interested in citrus or citrus trees, the title is misleading.

DAVID J. ROGERS

SOIL CONSERVATION. Kohnke, Helmut and Anson R. Bertrand. 298 pages, illustrated, indexed. McGraw-Hill Book Company, Inc., New York. 1959. $6.75.

A textbook intended "to provide a clear picture of the fundamental nature and causes of soil erosion, of the aims of soil conservation, and of the methods of saving the soil and of maintaining its productivity."

ARTHUR CRONQUIST

ANTHROPOLOGICAL PAPERS (Glen Canyon Series No. 7). Woodbury, Angus M., (Biological Editor). 226 pages, illustrated. University of Utah Press, Salt Lake City, Utah. 1959. $3.50.

A presentation of the known information on the flora and fauna of Glen Canyon, Utah, with an outline of studies proposed to be made before the canyon is flooded by the lake behind the dam now under construction.

ARTHUR CRONQUIST

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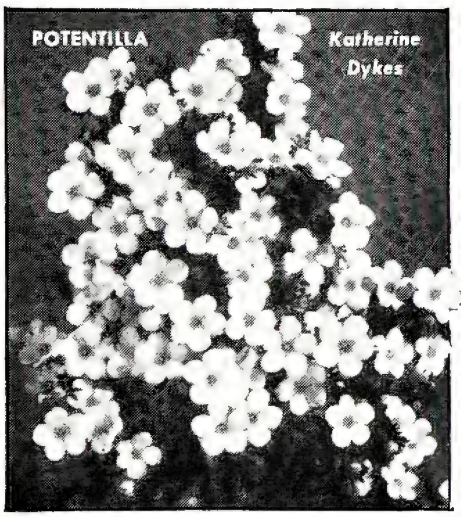

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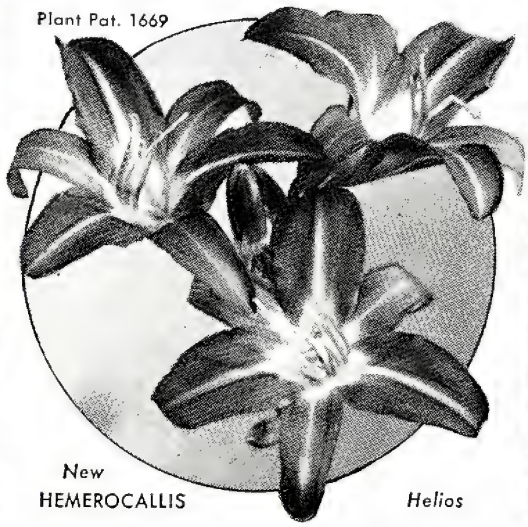

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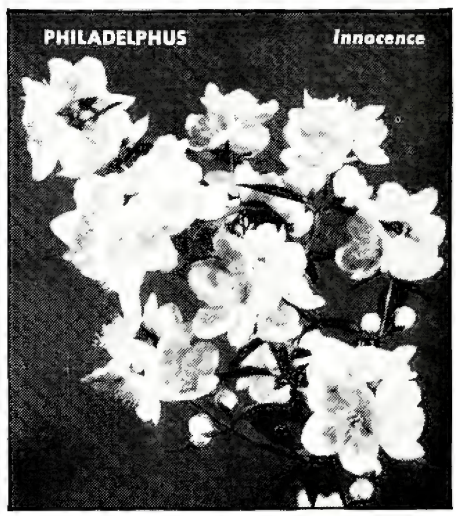

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